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OFFICE OF MANAGEMENT SERVICES

DBS - BUDGET BRANCH

CENTRAL FILES

VOLUME NO. 2
(Pages 192 to 380, inclusive)

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EXPLANATORY NOTES

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OF

INCREASES, DECREASES, AND CHANGES IN LANGUAGE

IN THE BUDGET FOR THE

DEPARTMENT OF AGRICULTURE

FOR THE

FISCAL YEAR ENDING JUNE 30, 1937

AND OF

WORK DONE UNDER EACH OF THE APPROPRIATION ITEMS

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FOREST SERVICE

General Statement

A. The Budgetary Situation, Fiscal Year 1935.

Because of emergency allotments, material reductions were made in the regular budget of the Forest Service for the fiscal year 1935. These reductions were sharp; in fact, many budgetary items were either reduced below a bare maintenance level or were entirely eliminated. This was particularly true of basic items for "Protection and Administration of the National Forests" and for such vital special projects as "Research".

Emergency allotments included those from ECW, CWA, FERA, and NIRA. These emergency programs operated, it is true, under separate rules as to classes of work which might be performed, placing of men in reference to urgent work needs, allowances available for operating overhead, equipment and material, wage rates, and so forth. Yet their conditions and volumes were then such that deficiencies in the regular budget could successfully be offset. The Forest Service experienced, therefore, no major budgetary problems in the fiscal year 1935.

B. The Budgetary Situation, Fiscal Year 1936.

In the fiscal year 1936, conditions were radically different. The most flexible and useful emergency allotment - NIRA - disappeared; the operating budget for ECW was so reduced that its usability for National Forest projects was greatly curtailed; and major allotments received by the Forest Service from the new Emergency Relief program were so restricted by budgetary allowances and rules of use that its funds could only partially replace regular ones. Furthermore major increases in regular funds allowed the Forest Service (for 1936 over 1935) were restricted to (a) administration of new areas recently added to the National Forest system, and (b) forest research, and (c) forest roads and trails - an item always recognized as a fixed percentage of the entire road building program of the Government.

Despite emergency allotments, key items in the Forest Service's 1936 budget were, therefore, generally below the requirements of the service. As a consequence, a very real budgetary problem has arisen.

The basic reason for this fiscal year 1936 problem (already serious and bound to be more so) is not in Forest Service operating practices, for they have led to enviable records of accomplishment in the purposes for which emergency allotments were made. It lies, instead, in those difficulties which - inherent in the set-ups and basic purposes of the various emergency authorities themselves - preclude successful substitution of emergency for the meager regular funds allotted in 1936 for essential Forest Service activities. For example:

(a) Under relief, employment is necessarily apportioned in relation to total population and total unemployment (or relief cases), on a formula basis, nationally applied. But the 154 National Forests (which form a huge reservoir of constructive work projects planned directly to increase values and uses of Federal properties and resources in 37 States and 2 Territories) are, in general, in mountainous areas of light population, so that, under relief formulae only, volume of relief employment does not coincide with major National Forest work needs.

(b) Emergency allotments are rightfully oriented toward unemployment relief. When determined by relief agencies, operating budgets are now uniformly too low to provide that overhead, equipment, and material which experience has shown is vital on most of these essential National Forest work projects which have long been planned to assure orderly protection to and development of Federal properties; and naturally so, since emergency funds must be spread thin in order to get maximum coverage. This requires concentration on simple lower-priority projects. It necessarily leaves many vital, high-priority National Forest ones undone.

(c) Emphasis in emergency programs is, and should be, on over-winter employment. Under such conditions, remarkable progress has been made on National Forest projects in relatively accessible, low-altitude territories. But National Forest low-altitude territory is - and high priority projects within it are - relatively limited. Much National Forest territory, embracing a very high percentage of its high priority projects, is not susceptible to effective winter employment, either with emergency or regular allotments. Instead, this territory and these projects require concentrated summer employment.

(d) To meet relief objectives, men to be employed must be selected for reasons other than for their skill or ability to handle specific projects. This, with imposed budget and other emergency restrictions, results in such a deficiency of skilled workers and technicians (in relation to unskilled labor) that many essential National Forest Projects must be passed over for those of far lower priority.

C. The Budgetary Situation, Fiscal Year 1937.

To prevent misunderstanding which might otherwise be possible, the statements are reiterated here -

That emergency allotments have made possible the accomplishment of a very large number of planned, constructive, permanently valuable National Forest projects.

That the Forest Service has made an earnest and successful effort to fulfill the basic purposes of the many relief organizations from which it has received (and is receiving) emergency allotments.

That every effort consistently has been made to use emergency funds on National Forest projects which otherwise might have been financed with regular funds.

But large-scale operations over some two and one-half years lead to the reasoned conclusion that, because of difficulties (some of which have been enumerated here) inherent in emergency set-ups, emergency allotments can not now successfully be used in lieu of regular funds (as was the plan when drastic cuts were made in the 1935 budget and continued in that of 1936) to carry on urgent, current, regular work of protecting, administering, and developing for use the National Forest properties. To accomplish this adequately, a very substantial increase in regular funds for the 1937 budget over funds for 1936 is necessary.

In addition, many of the regular jobs of the Forest Service have already increased over what they were in October 1934, when the regular 1936 budget was passed upon. For example, administration of new National Forest purchase units, financed in part from emergency funds (with additional areas to be added before July 1, 1936) and maintenance of more than 37,000 miles of new roads and trails, 42,000 miles of telephone lines, fences, and fire breaks, and 14,000 structures, all built under emergency programs.

There is, too, the necessity for (a) strengthening fire protection personnel so it may be possible to reduce losses in forest values and to reduce deficiency appropriations for fighting forest fires; (b) strengthening the National Forest skeleton organization (on administrative units which now total some 170,000,000 acres) so as to catch up with - then handle currently - administrative work which of necessity has been neglected for some two and one-half emergency-period years; (c) continuation of such partially completed projects as insect and disease control; (d) the proper management of timber, forage, wildlife, and recreational resources of the National Forests; (e) such research as will keep basic knowledge about our forest problem available to use by the operating organization; (f) enlarging the cooperative program with the States in forest-fire cooperation and the distribution of forest planting stock; (g) continuance of the Plains shelterbelt project; and (h) such increases in supervisorial, administrative, executive, and inspectorial staffs (in the Washington and ten regional offices) as will assure adequate standards and performances on 154 National Forests located in 37 States, Alaska, and Puerto Rico.

FOREST SERVICE

(a) SALARIES AND EXPENSES, FOREST SERVICE

Changes in Languages

The changes in language in the preamble of the Forest Service section of the bill have been made for the following reasons:

An increase in the building limitation from \$2,500 to \$5,000 is recommended because it is impossible to construct a satisfactory dwelling, and in some cases, warehouses under the present limitation of \$2,500.

A proviso has been inserted which will permit the construction of minor additions or betterments to buildings which have reached the building cost limitation. This authorization is particularly desired for the larger buildings now in the custody of the Forest Service, such as the Forest Product's Laboratory at Madison, Wisconsin, the office building at Ogden, Utah, the regional warehouse at Portland, Oregon, and the Forest Service supply depot at Oakland, California. Effective operation of such buildings involves annual recurrent programs of minor changes and betterments such as new partitions, doors, radiation, extension of service lines, etc., which are clearly not within the category of general maintenance.

(b) GENERAL ADMINISTRATIVE EXPENSES

	Regular	Emergency	Total
Appropriation, 1936	\$ 358,300	\$ 166,363	\$ 524,663
(a) Allotment from "National Forest Reservation Commission"	7,500	---	7,500
Total available, 1936	365,800	166,363	532,163
Budget Estimate, 1937	598,300	---	598,300
Net change	+232,500	- 166,363	+ 66,137

(a) Note.- The foregoing allotment of \$7,500 is carried forward by means of a transfer of the item for "National Forest Reservation Commission" in the estimates for 1937.

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase or decrease
<u>Obligated:</u>				
General administration:				
Regular funds.....	\$294,593	\$365,800	\$598,300	+\$232,500(1)
PWA lieu funds.....	9,445	341	---	- 341
PWA emergency.....	101,548	8,822	---	- 8,822
Emergency Relief funds..	---	157,200	---	- 157,200
Total obligations....	405,586	532,163	598,300	+ 66,137
<u>Unobligated:</u>				
Regular funds.....	731	---	---	---
Total (all funds).....	406,317	532,163	598,300	+ 66,137

(1) An increase of \$232,500 in regular funds to strengthen the general administrative organization of the Forest Service and to place the central office on an adequate financial footing. Because of the need for strengthening the field organization, it has been the policy of the Forest Service for years to allocate all increases in appropriations to field activities, despite the great increase in demands on the central organization. This has resulted in a serious undermanning of the central office, with the result that leadership has not been provided and much essential work in the field of forestry has been neglected. The required reorganization of the Washington office has been approved by the Department but cannot be put into effect without the increase requested. There has been a tremendous increase in volume of work, and the responsibilities of handling, among other major activities, the management of additions to the National Forest totaling more than 15 million acres; planning and supervising the CCC work program; exercise of adequate Federal leadership in the rapidly expanding fields of State and private forestry; management of the Plains shelterbelt project; service by the forests to social and economic reconstruction; demands for more intensive use of all forest resources, including timber, range, water,

game, and recreation areas; calls upon the Forest Service for many kinds of inter-agency cooperation and correlation, make demands upon the Chief of the Forest Service which cannot possibly be met without an adequate staff of administrative and technical assistants.

CHANGE IN LANGUAGE

The change in language in the item for General Administrative Expenses has been made to permit the payment of the expenses of the National Forest Reservation Commission from this appropriation.

WORK DONE UNDER THIS APPROPRIATION

This appropriation is used for salaries and expenses of employees in the Washington office engaged on general administrative and service-wide technical activities pertaining to management of the National Forests and for general service activities.

(c) NATIONAL FOREST ADMINISTRATION

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1936.....	\$ 8,009,577	\$ 5,005,633	\$ 13,015,210
Allotment to Division of Disbursements, Treasury Department (to cover disbursing services)...	- 10,000	---	- 10,000
Total available, 1936.....	7,999,577	5,005,633	13,005,210
Budget Estimate, 1937.....	11,706,335	---	11,706,335
Net change.....	+ 3,706,758	- 5,005,633	- 1,298,875

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	(Estimated)	Increase or decrease
<u>Obligated:</u>				
Timber use-				
Regular funds.....	\$ 468,910	\$ 549,074	\$ 771,388	+\$ 222,314(1)
Emergency Relief funds...	---	6,491	---	- 6,491
Total.....	468,910	555,565	771,388	+ 215,823
Forest fire prevention and preparedness-				
Regular funds.....	1,871,839	2,390,888	3,398,340	+1,007,452(2)
PWA lieu funds.....	238,834	5,367	---	- 5,367
ER funds.....	---	723,083	---	- 723,083
Total.....	2,110,673	3,119,338	3,398,340	+ 279,002
Forest fire suppression-				
Regular funds.....	217,815	253,298	253,298	---
ER funds.....	---	85,690	---	- 85,690
Total.....	217,815	338,988	253,298	- 85,690
Protection against tree insects-				
Regular funds.....	48,807	129,654	179,654	+ 50,000(3)
PWA lieu funds.....	71,847	---	---	---
PWA emergency.....	115,206	4,744	---	- 4,744
ER funds.....	---	162,624	---	- 162,624
Total.....	235,860	297,022	179,654	- 117,368
Protection against tree diseases-				
Regular funds.....	35,641	184,264	544,550	+ 360,286(4)
PWA lieu funds.....	137,623	---	---	---
PWA emergency.....	495,283	19,486	---	- 19,486
ER funds.....	---	363,755	---	- 363,755
Total.....	668,547	567,505	544,550	- 22,955

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase or decrease
Timber surveys and plans-				
Regular funds.....	\$ 130,650	\$ 163,573	\$163,573	---
PWA lieu funds.....	12,374	4,000	---	- 4,000
PWA emergency.....	74,823	3,068	---	- 3,068
ER funds.....	---	29,165	---	- 29,165
Total.....	217,847	199,806	163,573	- 36,233
Timber stand improvement-				
Regular funds.....	245,041	285,041	285,041	---
PWA emergency.....	1,045,899	33,825	---	- 33,825
ER funds.....	---	581,229	---	- 581,229
Total.....	1,290,940	900,095	285,041	- 615,054
Reforestation and revegeta- tion of denuded Areas-				
Regular funds.....	98,751	244,912	244,912	---
PWA lieu funds.....	14,000	6,000	---	- 6,000
PWA emergency.....	158,197	7,313	---	- 7,313
ER funds.....	---	318,823	---	- 318,823
Total.....	270,948	577,048	244,912	- 332,136
Nurseries and planting stock-				
Regular funds.....	73,254	402,929	402,929	---
PWA lieu funds.....	102,486	30,312	---	- 30,312
PWA emergency.....	12,800	---	---	---
ER funds.....	---	82,712	---	- 82,712
Total.....	188,540	515,953	402,929	- 113,024
Grazing use-				
Regular funds.....	620,770	650,077	850,077	+ 200,000(5)
ER funds.....	---	96,940	---	- 96,940
Total.....	620,770	747,017	850,077	+ 103,060
Grazing surveys and plans-				
Regular funds.....	41,939	62,988	162,988	+ 100,000(6)
PWA lieu funds.....	13,180	4,903	---	- 4,903
PWA emergency.....	33,802	1,528	---	- 1,528
ER funds.....	---	12,063	---	- 12,063
Total.....	88,921	81,482	162,988	+ 81,506
Recreation and land use-				
Regular funds.....	283,158	319,884	419,884	+ 100,000(7)
ER funds.....	---	218,841	---	- 218,841
Total.....	283,158	538,725	419,884	- 118,841

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase or decrease
Recreation surveys and plans-				
Regular funds.....	\$19,603	\$27,876	\$77,876	+ \$50,000(8)
ER funds.....	---	12,063	---	- 12,063
Total.....	19,603	39,939	77,876	+ 37,937
Land classification, settle- ment, and claims-				
Regular funds.....	91,307	96,479	96,479	---
PWA lieu funds.....	475	697	---	- 697
Total.....	91,782	97,176	96,479	- 697
Acquisition of land by direct purchase-				
Regular funds.....	30,891	212,826	212,826	---
Acquisition of land by exchange-				
Regular funds.....	59,900	69,957	69,957	---
Fish and game protection-				
Regular funds.....	108,900	137,639	287,639	+ 150,000(9)
ER funds.....	---	62,274	---	- 62,274
Total.....	108,900	199,913	287,639	+ 87,726
Fish and game surveys and plans-				
Regular funds.....	10,891	12,665	62,665	+ 50,000(10)
ER funds.....	---	12,063	---	- 12,063
Total.....	10,891	24,728	62,665	+ 37,937
Construction of truck and horse trails-				
Regular funds.....	326,721	360,721	360,721	---
Maintenance of truck and horse trails-				
Regular funds.....	119,734	134,734	134,734	---
Construction of structural improvements-				
Regular funds.....	435,628	483,628	683,628	+ 200,000(11)
PWA emergency.....	1,997,794	97,722	---	- 97,722
ER funds.....	---	1,477,429	---	-1,477,429
Total.....	2,433,422	2,058,779	683,628	-1,375,151
Maintenance of structural improvements-				
Regular funds.....	169,121	364,052	1,330,758	+ 966,706(12)
PWA lieu funds.....	127,941	33,990	---	- 33,990
PWA emergency.....	602,193	---	---	---
ER funds.....	---	368,519	---	- 368,519
Total.....	899,255	766,561	1,330,758	+ 564,197

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase or decrease
Construction of nonstructural improvements-				
Regular funds.....	\$87,126	\$101,613	\$301,613	+\$200,000(13)
PWA Emergency.....	1,020,615	39,720	---	- 39,720
ER funds.....	---	23,593	---	- 23,593
Total.....	1,107,741	164,926	301,613	+ 136,687
General surveys and maps-				
Regular funds.....	213,224	239,428	289,428	+ 50,000(14)
PWA emergency.....	183,209	7,170	---	- 7,170
ER funds.....	---	68,431	---	- 68,431
Total.....	396,433	315,029	289,428	- 25,601
Equipment and stores-				
Regular funds.....	98,016	105,382	105,382	---
Cooperation with other departments, bureaus, and agencies-				
Regular funds.....	10,545	15,995	15,995	---
<u>Total obligations:</u>				
Regular funds.....	5,918,182	7,999,577	11,706,335	+3,706,758
PWA lieu funds.....	718,760	85,269	---	- 85,269
PWA emergency.....	5,739,821	214,576	---	- 214,576
ER funds.....	---	4,705,788	---	-4,705,788
Total.....	12,376,763	13,005,210	11,706,335	-1,298,875
<u>Unobligated:</u>				
Regular funds-				
Savings.....	17,616	---	---	---
Total, Regular funds.....	5,935,798	7,999,577	11,706,335	+3,706,758(A)
" PWA lieu funds.....	718,760	85,269	---	- 85,269
" PWA emergency.....	5,739,821	214,576	---	- 214,576
" ER funds.....	---	4,705,788	---	-4,705,788
Total (All Funds).....	12,394,379	13,005,210	11,706,335	-1,298,825

(A) The increase of \$3,706,758 in regular funds includes:

(1) An increase of \$222,314 for timber use. The demand for National Forest timber is rising sharply as building activities climb steadily back toward a normal level. As new timber-sale operations are started and old operations which have been dormant reopen, additional personnel is required to handle the work. In addition, some provision must be made for handling the considerable increase in the demands upon National Forest timber for self-help associations and a great number of farmers and other residents living on or near the National Forests who have been forced to change their habits of obtaining fuel, lumber, and timber supplies because of depression and drought conditions.

(2) An increase of \$1,007,452 for forest-fire prevention and preparedness. During the fiscal year 1936 it is expected that an additional 5,000,000 acres will be added to the National Forests by purchase. In the western regions nearly a million acres have been added by exchange and various enlargements made to the National Forests since any increase has been given for forest-fire prevention and preparedness.

During the summer of 1935, disastrous fires in critical areas disclosed weaknesses which can only be cured by the employment of additional guards and protective facilities for the 3- or 4-month period of fire danger.

In too many instances, the force of fire guards is so thinly spread that fires grow to unmanageable size before they can be reached, and the result is a conflagration not only destructive to natural resources but adding heavily to the annual deficiency for fighting large fires. The burning of the National Forests is no longer looked upon passively by the public. The Government is being criticized, with considerable justice, for its slowness in providing an adequate fire organization and modern fire-fighting equipment.

The increase requested will make it possible to strengthen the yearlong organization and to employ a total of 5,785 guards at an average wage per man per season of \$404. Fire guards and other seasonal Forest employees, working a few months each year on the National Forests with their families maintained on privately owned subsistence homesteads on or near the Forests, constitute a demonstration of one important means of solving problems on unemployment and social breakdown. Personnel obtained under this item must have known competence and skill for difficult technical tasks. Substitution of inexperienced emergency employees has been tried but has led to unsatisfactory results. A regular, planned basis for fire control personnel is vital.

(3) An increase of \$50,000 for protection against tree insects. Epidemics of tree-killing insects, which commonly attack the oldest and most valuable trees, can reduce the merchantable volume on an area to the point where lumbering is unprofitable. When this happens, plans for sustained yield and for stable industries and communities based on that sustained yield are disrupted. Protection of the forest against such disasters is therefore essential and is one of the costs of the management of forests which must be met if that management is to be successful.

The most serious insect threats are in the areas of virgin forests in the West. Here the barkbeetles act much like forest fires, in that epidemics can not be anticipated as to definite location. The drought conditions of recent years seem to have been favorable to the increase of these destructive pests, however, and it is necessary to have funds available for the hire of temporary laborers to cut the infested trees and to kill the insects in them by burning, or sometimes by exposure, so as to prevent multiplication and further increased losses. Various emergency funds have been used for this work in the fiscal years 1935 and 1936, but it is not anticipated that they will be available in the fiscal year 1937. The need arises suddenly and in unexpected places. The amount requested is necessary to cover the work expected to be necessary in 1937.

Very little expenditure for equipment is required in this work. From 80 to 90 percent of the total goes for the hire, subsistence, and transportation of laborers. Where the work is necessary, it offers employment in the late fall, early spring, or even, in some cases, in the winter, when other work is scarce, and at the same time protects the permanency of the communities dependent on the timber crop. The form in which emergency funds must be spent has not permitted the full use of such funds for this activity. Insect epidemics arise rapidly, and effective handling requires the flexibility inherent under regular appropriations and largely lacking under emergency funds.

(4) An increase of \$360,286 for protection against tree diseases.

The most important tree-killing disease on the National Forests is the white-pine blister rust. This European disease is thoroughly established in the forests of western white pine in Idaho, western Montana, and Washington and is moving southward through Oregon into the sugar-pine region of California. These western species of white pine are even more susceptible to this disease than is eastern white pine. In northern Idaho and the adjacent parts of Montana and Washington white pine is by far the most valuable tree in the forest, and the local communities are dependent for their very existence on its continued production. Sugar pine is California's most valuable species and has proven to be especially susceptible to blister rust. If blister rust is not controlled it will remove this most valuable tree from the California forests.

This disease has to spend part of its life-cycle in the leaves of currant or gooseberry bushes and can travel back to pine trees only for a distance of about 1,000 feet. The destruction of these bushes prevents infection of the pines. The work therefore consists of finding and uprooting the currant and gooseberry bushes in the immediate vicinity of white-pine stands or, where more economical, killing these bushes with chemicals. Once an area has been worked over, maintenance is only a small fraction of the initial cost.

The work is very largely hand labor, with an average of 80 to 90 percent of the total expenditure used for the pay, subsistence, and transportation of men. Large areas, in excess of 800,000 acres, have been covered by the use of funds for emergency employment, including

P.W.A., F.E.R.A., and C.C.C., but there remain about 500,000 acres of National Forest land needing this protection in the north Idaho region, and the funds estimated for are essential to handle areas not covered and out of reach of CCC camps.

In Arizona and New Mexico a twig blight has done much damage to the pine forests in the vicinity of Prescott and Silver City. This disease has caused great alarm among the users of the areas and appears to be a serious danger to much larger areas. If it continues, it will be necessary to use about \$100,000 of the estimated funds to prevent further spread. Emergency funds have been used extensively under this item, and a large share of the total job in sight has been completed; but completion will require regular funds, since the emergency allotment E.C.W. remaining for fiscal year 1937 is not well adapted to the remaining portion of the job.

(5) An increase of \$200,000 for grazing use. Eighty-nine million acres of National Forest land used for grazing and vital interests of dependent communities have suffered because of administrative time required for orderly and well-coordinated range use has unavoidably been diverted to duties which, while not more important, have made more imperative claims upon official time. The increase requested will restore the badly needed attention required for intelligent and efficient management of this use of National Forest land. Twenty-six thousand permittees are threatened with bankruptcy when supervision of the use of these ranges is neglected.

Restoration of the administrative time formerly available for administering the grazing use is required to prevent a repetition of destructive overgrazing in times of declining rainfall, to find the answer when dependent communities need and claim grazing privileges on ranges which are already overcrowded, to prevent destructive trespass, to make the grazing use play its proper part in successful land use planning for large provinces, to find ways to restore depleted ranges, and to reconcile conflicting claims of recreationists, fish, and game interests and those dependent on live stock for their livelihood.

The only alternative to a restoration of the attention grazing once received is continuous and drastic reduction of permitted livestock, with all the resulting injustices and economic disasters to dependent communities and individuals.

(6) An increase of \$100,000 for grazing surveys and plans. Time and effort by district rangers and higher officers charged with general land-management responsibilities will not meet the existing acute problems arising from continued drought, pent-up demands due to the policy of providing adequately for small owners only at ten-year intervals, and threats of a recurrence of overproduction. Expert investigation, inventories, and forecasts are required. Seemingly irreconcilable conflicts between the claims of different types of land use must be handled by surveys and investigations by experienced range specialists.

The increase requested is required in any balanced effort to put the grazing use of National Forests on a sound basis. Effective work under this item requires small, skilled, mobile crews not obtainable under emergency allotments.

(7) An increase of \$100,000 for recreation and land use. The very nature, extent, and geographic distribution of the National Forests subjects them to a very large volume and wide variety of public uses and services supplemental to their primary functions of timber, forage, and wildlife production, streamflow stabilization, and soil-erosion control. Refusal to allow such supplemental uses would create serious social and economic hardships; but, unless they are carefully supervised, they would adversely affect public interests and property to an alarming degree. This increase is therefore to provide the absolutely essential administrative machinery for such supervision and control, the need for which progressively increases with each succeeding year.

The use which in point of numbers and distribution is of paramount importance is the public recreational use, now twelve times as great as it was in 1917. Over 58,000,000 people visited or passed through the National Forests in 1935, and probable increases in leisure time, both voluntary and enforced, promise still further to increase the numbers of National Forest visitors. If widely diffused throughout the forests and without adequate supervision, these vast numbers of people would create impossible hazards to public health and property; but, subject to simple principles of direction and supervision, their occupancy is in all respects desirable. Direction and supervision should not be arbitrary or coercive but rather promoted by provision of suitable campgrounds adequately policed, which minimize hazards to public health and property. Within the National Forests there are over 4,200 areas recognized as chiefly valuable for public campground purposes, of which about 3,000 now contain some facilities for sanitation and fire control, although not all are fully equipped. The attention hitherto given recreational occupancy has been inadequate.

During the fiscal year 1934 there were outstanding 37,696 permits authorizing occupancy of National Forest lands for summer home, resort, industrial, commercial, and other purposes. Such uses should receive continuing supervision to guarantee against conflict with higher public interests and to promote the fullest realization of the social and economic values of the publicly owned lands. These forms of use and occupancy also are increasing in numbers and in requirements of administration and must receive increased attention by the field personnel. A moderate sized continuing program is more and more a necessity. Emergency allotments are not well adapted to this need.

(8) An increase of \$50,000 for recreational surveys and plans. Widely distributed throughout the National Forests, but integrated therewith and demanding management in common with surrounding and related lands, are many areas of high scenic, inspirational, and recreational quality. These are public heritages which with the passing years and the profound changes occurring elsewhere will ultimately be of surpassing social and economic importance. The provision by other means of similar service to the public would require outlays of many millions of dollars for purchase and development.

Such areas are, however, subject to many hazards of unplanned occupancy or of industrial uses conflicting with their intrinsic inspirational and esthetic values. Current demands for rights of way, uses

of natural resources, forms of land occupancy, etc., in the absence of carefully prepared plans, readily might impair the inherent potentialities of such areas and result in ultimate losses of incalculable proportions. To avert such possibilities careful surveys, inventories, and plans of development should be executed without further delay. The problems involved are technical in character and the work should be done by technically qualified personnel, such as landscape architects, experts in mass recreational management, and engineers skilled in dealing with natural elements. A total of 15 such technicians could be so employed effectively, in addition to the men required to handle the administrative phases of the work. This item requires small crews of specialized personnel, or individual officers, not obtainable under emergency allotments.

(9) An increase of \$150,000 for fish and game protection. The present administration has focused public attention on the use and abuses of land. As a general result of the leadership exercised in this field, the Federal Government is expected to demonstrate its conclusions by application of sound plans of land use. Being the largest owner of land, it has ample opportunity to meet the expectancy of its shareholders, the general public. No better opportunity exists than is afforded by the use of national-forest land for the production of game. This is a virgin field in which the Federal Government can set the example for millions of other land owners. It has the advantage of most private landowners, since the problem was early recognized by the Forest Service and the more elementary forms of protection to wildlife applied at the beginning of forest administration.

As time passed, more knowledge was acquired and more intensive protection was accorded. Under early legal interpretations, however, all protective work recognized the State as having exclusive jurisdiction. The activities of the Government, therefore, were restricted to the development of a favorable public sentiment for game protection and, through cooperation with the States, the establishment of State refuges and Federal refuges and the enforcement of State laws. This cooperative effort has succeeded in maintaining a fair breeding stock in some localities, restocking others, and in actually overpopulating large areas inaccessible to modern means of transportation.

By and large, the total wildlife on the National Forests has increased, but experience has demonstrated that we are a long way from any systematic plan which would deal with specific areas and the possibility of maintaining wildlife at the full productive capacity of the range. Having a breeding stock already available, and in the face of still further increase, an adequate protective force becomes imperative as the initial step in meeting the justified public demands for better administration. This is essentially true because of the expanded territory in which wildlife is becoming a more acute problem, the ever-increasing human occupancy of the area resulting in a greater number of law violations, and the very urgent necessity of better feed and cover protection on numerous but restricted winter feeding areas. Obviously, a force no more than sufficient to perform the regular administrative duties can give only incidental time to the enforcement of protective laws or developing ways and means of combating the ravages on wildlife by predatory

animals, climatic conditions, etc. If, therefore, the Federal Government wishes to demonstrate one phase of successful land use by the development of the wildlife resource for the benefit of all the public, such provision as contemplated by this item must be made. Specialized, skilled personnel permanently assigned to this activity is essential. Such personnel and conditions of employment are not obtainable from emergency allotments.

(10) An increase of \$50,000 for fish and game surveys and plans. Successful land-use plans can be developed only by intensive surveys. The same need for surveys to determine the amount and character of our wildlife range exists as for domestic livestock, timber, or other resources. Yet over 80 million acres of potential wildlife range on the National Forests have had no such attention and only general knowledge exists as to the potentialities in wildlife production. These contemplated surveys are comparable to those made on ranges used for domestic livestock. They secure fundamental data on the feed resources adaptable to wildlife. After a determination of the amount and character of feed, its carrying capacity, the existing population of wildlife, and the general conditions prevailing, the data are supplemented and coordinated with facts resulting from research by the Biological Survey on the food and breeding habits, disease, predatory animals, and parasites of the various species of wildlife involved. These data form the basis of management plans of each of the natural units of range, which, when formulated, prescribe the optimum number of wildlife to be allowed, the protection needed, the extent to which predatory animals will be controlled, the relation of one species to another, the number and sex to be removed each year, the areas to be closed to hunting, and the season during which hunting may be allowed on other areas. Where hunting is permitted, the necessary regulations on numbers of hunters and their bag limits are prescribed. In brief, management of wildlife ranges consists of applying the same principles which have been developed by years of study, research, and experience on ranges used by domestic livestock. The necessary data obtained by surveys of the forage are essential, however, to the application of these principles and in no way conflict with the work of the Biological Survey. The latter covers the investigative or research field; the former merely applies a forage survey technique developed and used by the Forest Service for a great many years.

The need for this increase is emphasized by the facts that 75 percent of the big-game range in the West is on the National Forests; that these areas contain the principal fishing streams which are capable of the same intensive management as the land; that the best and largest areas for fur production are on National Forests; that the land is all Federal property; that the sentiment of both Congress and the Administration has been expressed by the Secretary of Agriculture in promulgating a regulation which imposes upon the Forest Service increased responsibilities in the protection and development of the wildlife resource. Such specialized surveys, requiring carefully selected personnel, have not been possible under past emergency allotments. A regular budgetary basis is required.

(11) An increase of \$200,000 for construction of structural improvements. This increase is requested for the purpose of constructing high-priority protective, administrative, and campground improvements which it has not been possible to construct under the various emergency relief and Emergency Conservation Work programs. While a minor percentage of this total will be used for administrative and protective improvements, the most pressing need at the present time is for the construction of sanitary, fire protective and housing facilities on public campgrounds.

The numbers of persons visiting or passing through the National Forests yearly now exceed 58,000,000. Their indiscriminate occupancy of the National Forests would create serious hazards to public health and public property. It would be equally tragic to deny so many citizens the right to use and enjoy the public properties in ways conducive to good citizenship and health. The situation is best met by encouraging voluntary concentrations of the visitors in areas where provision can be made for sanitation and fire control. This has been done by the establishment of public campgrounds, which now number about 4,200. To encourage use of such campgrounds it is necessary to equip them with the facilities essential to comfort and safety. Some 3,000 campgrounds have thus been equipped at least in part, and the remainder should be similarly improved without further delay.

Due to limited funds, the campground improvements hitherto established have been of types far below the standards which should prevail. Additionally, they consist only of utilities requisite to sanitation, fire control, etc., and do not include many of the requirements of modern outdoor life, such as simple cabins, lodges, community centers, shelters, etc., through which the American people could most fully enjoy the recreational potentialities of the public forests. Steps should be initiated promptly to install improvements which in variety of services, in numbers, and in standards of excellence approximate the real requirements of the visiting public.

Such a program would do much to enhance the human values of the National Forests and increase their usefulness to the citizens of the Nation. It would also create a field for the constructive employment of thousands of men who otherwise would be dependent upon public relief. Work relief of the character which would be provided by such a program would cost less than direct relief, would preserve the respect and moral courage of the beneficiaries, and would leave the Nation endowed with a recreational plant of tremendous social and monetary value. Every circumstance supports the conclusion that such improvements sooner or later must be installed. By initiating the necessary program without delay, its net cost can be infinitely diminished, since the expenditures required would in large measure be offset by savings in relief costs.

(12) An increase of \$966,706 for maintenance of structural improvements. This increase is requested for the purpose of maintaining the buildings, telephone lines, fences, water development projects, etc., with which the National Forests are equipped. While the system of fire control, administrative, range, and recreational improvements on the National Forests is not complete, large increases have been made in the varied forms of structure and plant required for successful management of these resources, and the investment will be jeopardized unless provision is made for the simple maintenance required.

Protection of national timber resources, including large areas which have been replanted, requires that before the beginning of each fire season telephone lines be gone over and put in working shape and damage to structures be repaired. Campgrounds must be cleaned up and put in usable shape and their fire-preventive safeguards freshly overhauled. Fences needed for prevention of trespass and for control of range stock must be repaired annually if they are to serve the purposes for which they were constructed. If maintenance is not kept up, an enormous eventual bill for replacements must be met or the investment abandoned. Due to uncontrollable causes of yearly damage, such as breakage by snow, wind, and water, and usual or normal breakage or damage by stock, the year-by-year efficiency of improvements is greatly impaired and the investment eventually lost unless annual repair is provided.

(13) An increase of \$200,000 for nonstructural improvements.-- This increase will be used for improvements of the nonstructural type which are so located as to be unreachable by CCC crews working in 200-man camps, such as fire breaks in the more remote areas, snag falling in areas not reached by roads for the purpose of establishing advance fire control lines, and stream improvements. The work will consist chiefly of simple nonstructural developments which will greatly increase the services rendered by the land to the general public.

(14) An increase of \$50,000 for general surveys and maps.-- With the larger Forest Service organization and the expansion in its activities and area, mapping information is more greatly needed and is utilized far more extensively than in the past. Also the demands for miscellaneous drafting and photographic reproduction are much greater than in earlier years. To meet the current needs, more surveys must be made and maps for new units and revised maps for established National Forests must be compiled and reproduced. The regular appropriations hitherto available are much too small to satisfy requirements that must be met.

Considerable areas within the national forests still lack maps of any dependable kind, and this is preventing the development of adequate fire detection and suppression facilities.

Aerial photographs have proven of inestimable value not only in the preparation of maps but for many activities necessary to Forest administration, protection, and utilization. No regular appropriation has hitherto been available to the Forest Service for this project, but through utilizing emergency appropriations the value of the work and the justification for the expenditure have been thoroughly demonstrated. Discontinuance of this work would be a serious loss.

CHANGE IN LANGUAGE

The transfer of the Wichita National Forest to the Bureau of Biological Survey makes it unnecessary to include the State of Oklahoma in the item for Region 2. Provision for the herd of longhorned cattle in that forest is also eliminated from the item for the same reason.

"Puerto Rico" is included in the item for Region 8, instead of in Region 7 as before, because of the transfer of the national forest in that Territory to Region 8.

"North Dakota" has been added to the item for Region 9, as a purchase unit which has been established there has been included in that region.

The proviso under Region 9 setting aside \$1,000 for maintenance of the dam at Cass Lake, Minnesota, is eliminated. This dam is now within the exterior boundaries of the Chippewa National Forest and it is therefore no longer necessary to make specific provision for its repair and maintenance.

WORK DONE UNDER THIS APPROPRIATION

General.--- This appropriation covers all field activities relating to the administration, protection, and development of the National Forests except the special appropriations for the construction of roads and trails under the Federal Highway Act and the Act authorizing the expenditure of ten percent of National Forest receipts for this purpose; the acquisition of additional forest lands under the Act of March 1, 1911; emergency expenditures for fire suppression; and expenditures from funds deposited to the credit of the Forest Service by counties, States, associations, and individuals for fire prevention and suppression, brush disposal, construction and maintenance of improvements, and reforestation.

While the description of the work done under this appropriation appears under the work project headings, it should be recalled that a large percentage of the personnel paid from this appropriation are unit managers of ranger districts, national forests, and national-forest regions who participate to varying degrees in all of the projects listed in these estimates. The need for these men and their general assistants is determined by the composite job load on the unit administered. The amount set aside for the salaries and expenses of these men and other general expenses such as rent, telephone and telegraph, etc., has been given the designation "Field Operating Organization" and will be so referred to in the following paragraphs.

Timber use.--- The total stand of national-forest timber of saw-timber size is estimated to be 552 billion board feet, of which 357 billion are in the three Pacific Coast States and 189 billion in the Rocky Mountain States. The Act of June 4, 1897 provides for the sale of the timber crop.

To derive the greatest benefit from the timber resource the mature or overmature timber must be cut. Timber, like any other crop, needs to be harvested. The cutting is done along definitely prescribed plans to improve the future stand, to gradually increase the productiveness of the timberland, and to obtain a steady and continuous yield of wood products best suited for the public need.

The disposal of national-forest timber is controlled by formal statements of policy which define the market to be served, the policy for the sale of the timber, and the general silvicultural methods to be followed in its cutting. When utilization becomes intensive, a detailed management plan is prepared which defines the order in which the various parts of the area will be cut, the silvicultural methods to be followed, and the limitation of cut necessary to maintain the output on a sustained yield basis. Generally speaking, the mature and overmature trees and also less desirable species are selected for cutting, leaving

thrifty young desirable trees for growth and later cutting when they are in turn mature. Thus the cutting of national-forest timber is systematized under measures designed both to improve and perpetuate the stand.

In addition to timber that is sold for commercial purposes, dead timber is also furnished free in limited amounts to bona fide settlers, miners, residents, and prospectors for minerals, and for firewood, fencing, building, mining, prospecting, and domestic purposes. Green timber is furnished free where the cutting will benefit the timber stand. In addition, sales at cost of administration, under special legal provision, are made to homestead settlers and farmers for material needed for the farm.

This project also includes the time and expenses of Forest Service personnel engaged in the effort to encourage sustained yield management on privately owned forest lands.

Forest fire prevention and preparedness or presuppression.-- Practically every employee paid from this appropriation contributes in some degree to this project.

The Act of June 4, 1897 originally provided for the protection of the National Forests from fire. Appropriations were small, however, and for years very little was done beyond the efforts of the permanent force of employees. The disastrous forest fire year of 1910 brought about a recognition of the size of the problem, and the present system of organized fire control dates back to that year.

The fire-prevention activity is carried on by apprehending and prosecuting persons responsible for starting fires, by requiring visitors to equip themselves with fire fighting tools, by the partial or entire closing of National Forests to public travel during dangerous periods, by "fireproofing" campgrounds, by the concentration of campers on public campgrounds, by prohibiting smoking and camping at other than established campgrounds, by registering and cautioning tourists, by clearing road rights-of-way, and through news items, radio programs, motion pictures, exhibits, lectures, admonitory signs, and distribution of pamphlets and other literature.

The task of controlling forest fires is largely one of advance preparation. Inasmuch as the fire-control problem is one of high priority, practically all the members of the permanent organization are available for fire duty. In addition, approximately 3,300 temporary men (a total of 5,575 are provided for in these estimates) are employed during the fire season and are stationed at strategic points through the forests where they act as lookouts, "smokechasers", or patrolmen.

The lookouts are stationed at points which overlook large areas of forest land. These men are tied in by telephone to ranger district headquarters. They watch for fires and notify district rangers of the location of the fires. Smokechasers are stationed on roads or trails and are also tied in by telephone to ranger district headquarters, and when fires are reported the smokechasers are dispatched to the fire. Patrolmen both detect and suppress the fires which occur along their patrol routes.

Before the fire season opens complete plans are prepared, which include maps showing transportation and communication systems, areas visible from look-out stations, areas of greatest fire hazard, etc. Organization charts are also prepared showing location of all available man-power, including permanent and temporary employees, road and other crews, settlers and ranchers, sawmill and logging camp operators, etc. Similar information is included for the tools, equipment, and food supplies which may be needed if large crews are required for suppressing fires. Cooperative agreements are entered into with all agencies in the vicinity of the National Forest which may be of assistance in controlling forest fires. Men are selected and trained, and detailed written instructions are prepared for each member of the force.

Forest fire suppression.-- Fire is an ever-present danger in forested areas. The great size of the forests in comparison with the relatively small patrolling force, the inaccessibility of wilderness areas, the dry air, light rainfall, the prevalence of lightning in the mountains, and the constant use of fire in the daily life of the people and in industries combines greatly to increase the hazard.

Complete fire exclusion in a forest is rarely attainable, because fires originate from natural as well as human causes. However, an objective has been set up for each forest type based on the percentage of the areas that may burn over annually without seriously impairing the forest values as determined by the predominant purposes of management, and a constant effort is being made to reduce the number of man-caused fires and to hold down the acreage burned on each fire.

Upon receipt of the report of a fire, the regular organization functions immediately and men are dispatched to the scene. Though each fire-suppression job is an individual problem, there are certain basic principles of attack. The first requirement is usually to learn the size of the fire and determine its probable progress by noting topography, type of cover, wind conditions, dryness of litter, natural firebreaks, etc. Next comes the job of building the fire line where the plan indicates. The line is patrolled to prevent the fire from jumping it. Even after the control line has been completed and the fire checked, continual patrol is necessary to prevent it from breaking out again and going on a rampage. No fire is left until it is completely out.

Protection against tree insects.-- Tree insects are always present in the natural forest. Under normal conditions they are kept in check by their natural enemies. Ever since the Forest Service has had jurisdiction over the National Forests, close cooperative contacts have been had with the Bureau of Entomology and Plant Quarantine, the agency to which the Forest Service looks for its technical advice in the control of forest insects.

The purpose of insect control is to catch in the early stage infestations which are becoming epidemic in an endeavor to prevent widespread infestations. Much of the timber in the National Forests is overripe and is therefore more subject to insect attack than the thrifty faster-growing stands.

Insects are controlled in numerous ways, control procedure varying with the type of insect and its life cycle. Bark beetles, which are the cause of the greatest timber losses, are controlled by destroying the immature beetles before they leave the host tree, and this is usually accomplished by felling the trees and burning the logs, felling the trees and peeling and burning the bark, or by

spraying with oil and scorching thoroughly the standing tree. Defoliating insects are controlled by spraying the foliage with poison.

Protection against tree diseases.-- As in the case of insects, disease is practically always present to some degree in the natural forest. External influences such as man, wind, and fire have greatly increased the hazards of the forest from tree diseases. In addition to the native species of fungi at work in our forests, there have been a number of very destructive fungi introduced from abroad. The most outstanding examples of such fungi are the chestnut blight, the Dutch elm disease, and the white-pine blister rust. The chestnut blight became so thoroughly established in our eastern forests before being discovered that control proved to be impossible and as a result our American chestnut has almost entirely disappeared from our forests. The white-pine blister rust gave promise of repeating the history of the chestnut but adequate control measures have been developed and, if the finances can be provided, it is definitely known that white pine can be protected from this disease. The size of the job of protecting white pine from blister rust is pretty definitely known, and plans have been made which, if carried out, will insure the growing of white pine on its best natural sites.

The Forest Service looks to the Bureau of Plant Industry and the Bureau of Entomology and Plant Quarantine for its technical advice in the control of tree diseases. Very close cooperative relationships are being maintained with these bureaus.

The purpose of disease control is to catch in the early stages infestations which are becoming epidemic in an endeavor to prevent widespread infestations.

The treatment necessary to control a disease varies with the characteristics of that particular disease. Tree-rotting fungi are controlled by eliminating the infected host trees from the forest. A disease like the blister rust is controlled by eliminating the alternate host species--currants and gooseberries--from the vicinity of the pine. Since the spores from the infected pine can not directly infect other pines, but must first pass through a fruiting stage on the currants and gooseberries, the removal of these shrubs protects the pine from attack.

Timber surveys.-- When the National Forests were first placed under the jurisdiction of the Forest Service there was little or no reliable information available concerning the timber resources, and before attempting management of these forest properties a timber inventory was essential. Timber surveys are made for two purposes; first, to furnish a rough inventory of the timber and young growth available within the boundaries of a unit of management, called a working circle, and, second, for the purpose of obtaining refined estimates as a basis for sale. Usually both types of survey are needed on the same land, the first to initiate management and the second to put the management into effect.

Inventories are obtained by running strips through the forests at intervals and tallying the timber on these strips, thereby obtaining a percentage of the whole stand. The trees are tallied by diameter and height and a record of the young growth obtained at the same time.

Timber stand improvement.--- Timber-stand improvement represents a type of work highly essential if intensive forest management is to be practiced on our National Forest properties. Until recently, however, funds have not been available for this type of work. With the advent of Public Works funds and the CCC great strides have been made in this activity.

The object of timber stand improvement is to improve the conditions for growth in our various types of stands. Timber-stand improvement is accomplished through practices known as cleaning, thinning, and sanitation cutting, the object being to favor the thrifty specimens of the better species by releasing the selected crop trees from crown and root competition. This work is performed by carefully trained organized crews, properly equipped, proceeding through the woods in line formation, each man selecting his crop tree and releasing it from competition.

Reforestation and revegetation of denuded areas.--- This activity is largely on a special project basis, although general supervision is exercised by rangers and supervisors over the work of temporary employees.

Up to the time the National Forests were created fires ran rampant and large areas of forest land were devastated. There have also been bad conflagrations since the creation of the National Forests, particularly on areas where previous fires had only partially killed the timber. Under our acquisition program millions of acres have been included within the National Forests, particularly in the East. A good portion of these lands had been denuded by destructive logging and fire before being a part of the National Forests. Our present reforestation program today provides for the planting of 4 million acres.

The objective in reforesting these devastated lands is to preserve the watersheds of navigable streams, to restore municipal and domestic water supplies, to prevent and control erosion, and to grow crops of commercial timber.

Planting is done by trained crews of men operating either singly or in pairs, the trees being planted in rows with a spacing between trees of from 4 to 8 feet. The period during which planting can be done is restricted to spring and fall seasons.

Nurseries and planting stocks.--- This activity is conducted mainly through specialists and crews of temporary nursery workers.

The first Forest Service effort in growing trees for reforestation work began in small nurseries largely of an experimental nature, the work being handled very largely by the permanent employees. Under present plans the annual nursery capacity has been very greatly enlarged so that at the present time the Forest Service is equipped to supply more than 200 million trees annually.

In order to furnish stock for the planting program, it is necessary to grow the trees in the nurseries from one to four years, depending on the species to be used and the sites on which the planting will be done.

The size of the nursery depends largely on whether seedlings or transplant stock will be grown. In the latter case a much greater area is required. Nurseries are completely equipped with the necessary buildings for carrying on

the nursery activities, consisting of work shops, implement houses, bunkhouses, and mess quarters. Water must be made available to the area and is usually so piped as to make possible an overhead spraying system of watering. A force of men must be employed in each nursery from early spring to late fall for preparing the soil, sowing, watering and weeding the seed beds, transplanting, and lifting and packing the trees for field planting.

Grazing use.--- Approximately 82,500,000 acres on the National Forests are utilized by domestic livestock, including in the neighborhood of 1,500,000 cattle and horses and 6,000,000 sheep and goats owned by upwards of 25,000 permittees. In addition, practically all the lands within the National Forests are accessible to and are used by various forms of wildlife. Use of the National Forests by big-game animals has to be carefully coordinated with the use of forage by domestic animals. The administrative activities connected with the handling of applications for grazing permits, issuance of permits, inspection of ranges, supervision of improvement construction and maintenance, contacting stockmen in connection with range matters, handling complaints, appeals, etc., occupy a large part of the administrative personnel's time.

Supervision of the grazing activity is essential in order that the grazing resource may be conservatively used and at the same time contribute as fully as practicable toward the economic development and maintenance of Forest communities and through the maintenance of an adequate vegetative cover for the prevention of erosion and conservation of water. Constant planning is necessary to keep the grazing uses properly correlated with other legitimate uses of the related forest resources.

Grazing surveys and plans.--- For many years employees have been engaged in invoicing the range resources of the National Forests and in preparing management plans for the administration of the grazing resources. Many men who have received early training in survey parties have qualified for responsible technical grazing and administrative positions in the Forest Service.

Accurate information regarding the location, accessibility, and forage value of the grazing resources of the National Forests is of increasing importance in Forest administration as the demand for the use of national-forest resources increases and becomes more complicated. Such related uses as recreation and wildlife development and conservation and the increased demand from settlers for grazing privileges make it more than ever important that accurate knowledge of the grazing and related resources be obtained and applied in administration. This range surveys aim to accomplish.

Special crews prepare vegetative type maps, classify the vegetation, and estimate the carrying capacity. They record the condition of the range and of the soil, study the problems in range management, and develop plans whereby the grazing resources may be used conservatively and to the greatest advantage from the standpoint of community needs. Where good topographic maps are not available these are prepared, in order that a satisfactory base may be available for recording forage types, dividing the range into satisfactory management units, etc.

Recreation and land use.--- Public use of the National Forests for outdoor recreational purposes is a natural development coincident with the extension of

a system of forest roads and trails and the growing tendency of the American people to spend their vacation periods in healthful outdoor activity. By their very nature and wide geographic distribution the National Forests are admirably suited to large-scale public use for outdoor recreational purposes. Their extensive area and wide distribution in relation to centers of population, their diversified scenic character, their wide variety of natural interests, and the opportunities afforded for fishing, hunting, nature study, mountaineering, camping, etc., all tend to create optimum conditions for outdoor activities. There can be no doubt as to the desirability of full development of the recreational use of the National Forests, supplemental to the major purposes of the forests but not incompatible therewith. Such development means a realization of the highest public value of such land areas at a minimum public expense. During the fiscal year 1935, the summer residents and guests, hotel and resort guests, campers and picnickers totaled 9,718,320; persons specifically touring the National Forests to enjoy their scenery aggregated 7,104,686, and the motorists passing through the National Forests enroute to distant destinations totaled 41,725,001.

These enormous numbers of visitors create two basic requirements.-- first, to minimize hazards to public health and public property; and, second, to create conditions under which the occupancy of the National Forests will yield maximum returns in physical, educational, and spiritual benefits to the visitors. Without plan-wise use and supervision, bad sanitary conditions would result, there would be marked conflict with industrial uses of natural resources, fire risks would be greatly increased, the hazards to the visitors themselves would be much greater, and the comforts and benefits of national-forest occupancy would be greatly reduced.

Voluntary concentration of the visitors in areas of minimum sanitary and fire risk is induced by the designation of public campgrounds and their equipment with simple facilities. The National Forests contain approximately 4,200 areas recognized and dedicated as public campgrounds, of which about 3,000 have been at least partially equipped with essential facilities. The second essential is to carefully plan the use of areas suited for more permanent occupancy under permit so that such occupancy will not impair their basic natural values and will not conflict with higher forms of economic use. The third requirement is to maintain the beauty of the lands abutting on the main traveled roads. The fourth is the organization of a short-term force to supervise and inform the visiting public, this force consisting of Assistant Forest Rangers, Forest Guards, and campground attendants.

Recreational surveys and plans.-- Distributed throughout the National Forests are numerous integrated areas of exceptional natural interest of scenic charm or recreational quality of which the highest permanent use will be for recreational or allied purposes. These areas must be determined and classified and consideration given to the effect which their occupancy for recreational purposes would have upon industrial utilization of the natural resources of the surrounding national-forest lands, so that those areas where recreational occupancy will not be incompatible with other major phases of national-forest utilization may permanently be dedicated to public use. Since such areas contain rather important natural values which readily might be depreciated by improper types of development or occupancy, it is then necessary to prepare

rather detailed plans to govern their physical modification.

The objectives of the work, therefore, are (a) to determine the areas possessing high values for public recreation, (b) to correlate them with the major requirements of protection, administration, and industrial utilization of natural resources, and (c) to make sure that their natural values will not be impaired by ill-advised modifications for types of occupancy.

The method of approach is to assign the best available personnel to the work of classifying and inventorying the areas of outstanding recreational value, of determining the effect their occupancy for that purpose would have upon the protection and utilization of the National Forests, and of dividing the approved areas into appropriate units of occupancy, classifying such units on the basis of their highest types of use, making engineering studies, surveys, etc., to determine proper location of utilities, and devising programs of physical improvements by which to govern both public and private construction within the unit.

Land classification, settlement, and claims.--- The lands reserved for national-forest purposes from the public domain are subject to the provisions of the Forest Homestead Act of June 11, 1906 and the Classification Act of August 10, 1912. The Acts require the determination, classification, and listing of all lands chiefly valuable for agricultural purposes and not needed for more important public purposes. The original work of classification was completed a number of years ago, but need for revision, amendments, and readjustments intermittently arises and requires administrative action. Lands listed and entered under the Act require periodic supervision, and preliminary to application for patent reports must be made for the Department of the Interior. The national-forest lands reserved from the public domain also are subject to the general mining laws of the United States and to the public land laws relating to rights-of-way, easements, etc., in which cases the Forest Service acts as the field representative of the Department of the Interior, preparing the necessary reports and conducting the required supervision of development work. There are tens of thousands of mining locations within the National Forests and scores of applications for easements, rights-of-way, etc., which require attention each year.

The principal purposes of this activity are to insure (a) that the lands chiefly valuable for agricultural purposes are properly classified and made available for entry, (b) that all the requirements of the public-land laws are satisfactorily met, and (c) that use and occupancy under such public-land laws does not result in illegal and unjustified conflict with the protection and use of the national-forest lands and the public interests inherent therein.

The activity entails the use of the time of personnel on the work of field examination, the determination of fact, the preparation of reports, the presentation of evidence in cases of violation of legal limitations, and administrative routine in relation thereto. Proper control of mineral locations requires in itself the permanent employment of two technically qualified mineral examiners plus the part-time service of numerous forest rangers and other members of the field organization.

Acquisition of land by direct purchase.-- This project includes only the time and expenses of the field operating organization. A special appropriation or emergency allotment for the purchase of land has been made for each year since 1911.

Federal acquisition of forest lands for the protection of headwaters of navigable streams was inaugurated by the Act approved March 1, 1911. Federal purchases of lands primarily for purposes of timber production were first authorized by the Act of June 7, 1924. Under the Acts of March 1, 1911 and June 7, 1924 there have been created 97 National Forest purchase units situated in 30 States and in Puerto Rico.

The major objective of this work is to place under permanent Federal ownership and management the areas of forest land upon which the maintenance of optimum conditions of tree growth, timber production, and streamflow stabilization is a matter of national importance and can be accomplished only by Federal action, together with the areas for the administration of such lands.

Accomplishment of the above purpose entails national and State surveys of forest areas and conditions, specific determination and definition of the areas for which Federal ownership is dictated, determination of all land ownerships within such areas, and the solicitation of offers of sale to the United States; detailed examinations, estimates, cruises, and appraisals of the offered lands to determine their value; negotiations with the owners thereof to obtain options; preparation of detailed reports for review by executive officers and the National Forest Reservation Commission; survey of lands in the regions not covered by public survey; and prosecution of the routine steps incident to perfection of titles and final vesting of the land in Federal ownership. Most of the cost of this work is borne by the special appropriations or allotments made available for land purchase but certain of the costs of administrative review and action properly are chargeable against the general expenses of the Forest Service.

Acquisition of land by exchange.-- The National Forests contain approximately 25,000,000 acres of land in ownerships other than Federal, these consisting of grants to States and to railroads, various types of entry under the general land laws of the United States, and areas patented under the Forest Homestead Act of June 11, 1906. These lands are widely interspersed among the national-forest lands and frequently complicate and increase the cost of protecting, managing, and utilizing the national-forest properties. Outside of but contiguous to the national-forest lands are other forest lands which are integral parts of the same natural units of forest management, and in a number of instances Congress has authorized the acquisition of such lands by exchange. To date Congress has passed a total of 63 laws permitting acquisition of privately-owned forest lands suitable for national-forest purposes by grants in exchange of not to exceed equal values of national-forest land and/or stumpage in the same State.

The primary purpose of acquiring forest lands by exchange is to bring natural units of forest management, largely in public ownership, under unified plans or programs of management and use, to minimize the creation or maintenance on private lands of conditions of abnormal risk or hazard, and to reduce the

high costs of administration created by the occurrence of such private lands upon the Federal lands. The initiation of measures by which the natural productivity and social values of the privately-owned lands may be conserved is also an important requirement.

The conduct of this activity involves the receipt of applications for exchange; the examination, mapping, cruising, and appraisal of the offered lands to determine the maximum values which may be allowed therefor; the comparable examination, mapping, cruising, and appraisal where necessary of the Government lands to be selected in exchange, or of the national-forest stumpage to be granted for the private land; the negotiation of the terms of exchange with the owners of the private land; the preparation of the necessary reports for review by the various executive officers and by the Secretaries of Agriculture and the Interior or their staffs; and the subsequent transaction of the successive routine steps necessary to consummate the exchanges and deliver the national-forest lands or stumpage.

Fish and game protection.-- The chief means of conserving fish and game have been through closed seasons and game refuges. Closed seasons are established by State game authorities and are enforced by deputy game wardens and Forest officers. Some 296 State game refuges and 25 Federal game refuges within the National Forests have been established. Within these areas all hunting and fishing have been excluded, with the exception of a number of Federal refuges and recently a few State refuges where regulated hunting has been allowed.

Closed seasons and game refuges are valuable means of assisting nature in replenishing the wildlife population within limited areas. The method has not been successful in restocking adjacent depopulated areas or in regulating the repopulation of depleted areas. A more positive form of administration is necessary which will regulate the number of animals on protected areas and undertake an orderly program of distributing the wildlife not only within the protected areas but on outside depleted areas as well. One of the means developed to accomplish this object is Forest Service Regulation G-20A.

Under Regule the Secretary is authorized to specify the time, place, and manner in which wildlife may be removed and the limits of such removal. To apply this regulation requires thoroughgoing technical investigations to determine all the facts necessary for a game-management plan; administrative personnel to apply plans for regulating numbers and distribution of wildlife, and for cooperating with agencies interested in the conservation and agencies interested in the utilization of wildlife.

Fish and game surveys and plans.-- The wildlife resources on the National Forests consist of more than one million big-game animals, an equivalent number of fur-bearers, over 60 thousand miles of fish streams, and millions of game and nongame birds and small forms of game. The number of people who hunt and fish on the National Forests annually has increased 400 percent in a single decade, now numbering over 5 million exclusive of those who are attracted by the recreational and aesthetic values of wildlife.

Wildlife administration on the National Forests in the past has consisted largely of protection. Forest officers have cooperated with State Fish and Game authorities in enforcing State regulations, in planting fish, etc. In recent

years protection in some instances has resulted in overpopulation, particularly of big-game ranges. In other instances protective measures have been wholly inadequate, and many forms of wildlife such as beaver, upland birds, fish, etc., are becoming increasingly scarce. At the same time there has been a remarkable increase in the demand for an adequate supply of wildlife. It is essential that the Forest Service, which is responsible for the administration of the most important habitat of wildlife, participate much more effectively in the proper conservation of the wildlife within the National Forests. Positive management must take the place of passive and often inadequate protection.

Adequate facts must be obtained upon the forage resource in order that the proper number of animals of various species can be determined. The problems connected with their protection, development, and proper conservation must be attacked. In cooperation with the Biological Survey, the results of research on wildlife habits, food requirements, diseases, and predators must be applied. The proper correlation of wildlife management must be made with the use of national-forest resources for related purposes such as grazing by domestic stock, recreation, timber protection, mining, etc.

Factual data involving basic research in wildlife are to be obtained chiefly by the Biological Survey. The invoice of available forage and potential wildlife resources within the National Forests and the development of plans whereby these resources may be adequately conserved is a responsibility of the Forest Service. This work will require the concerted effort of specialists working on National Forests and directed by competent men in the regional and Washington office. The application of wildlife-management plans for each forest will be the responsibility of forest officers working in cooperation with State and local fish and game authorities. The discharge of this responsibility will involve much more man-power than heretofore has been available for this activity.

Construction of truck and horse trails.-- Most of the National Forests are located in sparsely settled sections of the country and were largely undeveloped and inaccessible when acquired.

The major costs of this work are borne under the appropriations "Roads and Trails for States, National Forest Fund", and "Forest Development Roads and Trails." This work project includes the time and expenses of the field operating organization which is concerned with the planning and supervision of the construction work, the payment of accounts, maintenance of records, purchase of supplies and equipment, and similar service activities in connection with this project. The direct costs of labor, materials, supplies, and direct supervision are paid from the appropriation mentioned above.

Maintenance of truck and horse trails.-- The direct costs of maintenance are borne by the Forest Road and Trail appropriations. However, a great deal of time is necessarily spent by the regular personnel in planning, coordinating this project with other activities, supervising the work, paying accounts, hiring personnel, purchasing supplies, and in similar service functions. The scheduling of this work is very important, inasmuch as all roads must be opened up in advance of the fire season.

Construction of structural improvements.-- At present no funds are available from regular appropriations for this activity. All of the charges shown in 1935 and 1936 represent the time and expenses of the field operating organization in supervising and planning the work of emergency employees.

Most of the National Forests are located in the mountainous regions of the country, largely undeveloped and inaccessible. To facilitate their administration and protection, it is necessary to equip them with various classes of improvements.

Telephone lines are needed for fire control in localities where commercial systems are not available; lookout cabins on mountain peaks to house men, and instruments properly located to discover lightning and other fires and to transmit the alarm; lookout towers where the topography does not provide a natural elevation sharp enough to command the necessary view; dwellings, barns, and other structures necessary to provide quarters for men and animals who must be stationed remote from any settlement or rentable quarters; simple office structures for housing records and transacting business required in administrative or fire control work; fences to prevent the trespass of unpermitted stock or to control the drift of permitted stock in order to secure the best utilization of National Forest ranges; water improvements in the form of developed springs and wells, pipe lines, and other works required at ranger and other stations, or for watering livestock on the forest ranges, or for public campgrounds; and other campground improvements designed to protect the forests, maintain sanitary conditions, and facilitate public recreational enjoyment of the forests by providing simple structures, etc.

Each National Forest region has a plan for its improvement needs. As funds are made available, those of highest priority are constructed along standardized specifications and simple practical lines.

Maintenance of structural improvements.-- The funds provided in the regular appropriations for the fiscal year 1936 provide for only a fraction of the maintenance required to keep essential improvements in repair. This project includes the repair of all forms of improvements except roads and trails.

Construction of nonstructural improvements.-- Besides the various structural improvements built for the proper administration and protection of the National Forests, certain improvements of a nonstructural nature are also needed. Included are permanent firebreaks and lanes placed in strategic locations to facilitate holding fires that escape from the initial efforts to control them; the clearing of debris and fallen timber along roadsides to reduce the fire hazard; the improvement and cleaning of fishing streams; soil-erosion work; the eradication of poisonous plants; the poisoning of ground squirrels, prairie dogs, and other rodents in cooperation with the Biological Survey; and other means to improve the productivity of the ranges, etc.

General surveys and maps.-- A greater and more intensive utilization of the older forests, the addition of new forest areas, or changes in boundaries of forests for purchase units require markings of property lines, project

surveys and maps for laying out transportation, detection and communication systems, recreation areas, nurseries, administrative stations, lookout towers, type mapping, and property ownership. Corrections of existing maps must be secured to make these suitable for Forest Service administration and protection. Some 51 forest maps must be corrected, traced, lithographed, and printed. More accurate locations of topographic features are required for the proper protection and administration of the forests.

The Forest Service is not engaged in general quadrangle mapping like that of Geological Survey, township and sectional surveys like the work of the General Land Office, or control surveys similar to those of the Coast and Geodetic Survey. However, where any topographic, cadastral, or control work is done, the standards used permit adoption and incorporation with later work of the other agencies.

Equipment and stores.-- This account has been set up to carry stores and equipment remaining in stock at the end of the fiscal year, which has not been charged to another project.

Cooperation with other departments, bureaus, and agencies.--- The Forest Service cooperates with other Government departments, bureaus, and agencies on activities not primarily of benefit or producing benefits to National Forest resources. Often the Forest Service is better qualified to carry on such work because of the technical experience of its personnel or because the geographic distribution of its organizations may enable it to better handle the work from the broad viewpoint of Government economy. This work is done in accordance with the standards established for the various jobs. Illustrative of this work project is the cooperation with the Bureau of the Census in their agricultural and lumber censuses; cooperation with the National Park Service, the Bureau of Indian Affairs, and the War Department regarding forestry problems on their lands; cooperation with the Department of Justice and the Treasury Department in law enforcement where National Forest lands are involved, etc.

(d) FIGHTING FOREST FIRES

Appropriation Act, 1936	\$100,000
Budget Estimate, 1937	<u>100,000</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Fire suppression	\$2,329,764	\$33,000	\$33,000
Protection of Oregon and California land-grant lands	85,296	67,000	67,000
Total obligations	2,415,060	(a) 100,000	100,000
<u>Unobligated</u>	32,940	---	---
Total	2,448,000	(a) 100,000	100,000

(a) Regular appropriation; does not include 1936 fire-fighting deficiency.

WORK DONE UNDER THIS APPROPRIATION

This appropriation is used primarily for the suppression of forest fires, with the exception of the amount required to give the lands known as the Coos Bay Wagon Road and Oregon and California railroad lands the same protection from fire which is given adjacent National Forest or privately owned lands protected by associations of private owners. Otherwise administrative restrictions placed upon the use of the appropriation by the Forest Service provide that expenditures shall not be made from it until forest fires have actually started. An exception is made to this rule, however, when fire conditions become so critical that the regular protective organization which is financed from "National Forest Administration" is unable to cope with the situation and when, therefore, the temporary employment of additional guards clearly will reduce expenditures for fire fighting.

Expenditures are made for the employment of fire fighters and their transportation, equipment needed on going fires when not available in stocks of equipment previously purchased from the "National Forest Administration" appropriation, or in connection with fires of previous years. The appropriation is used for travel expenses of forest guards when going to or returning from fires and for the travel expenses of regular employees of the Service when the travel performed extends beyond the boundaries of the units to which they are regularly assigned, or when the activities to which men are regularly assigned do not include fire fighting.

The amount appropriated (\$100,000) is nominal because it is impossible to predict in advance what the expenditures for such an uncertain activity may be. Supplemental estimates are submitted each year for the Deficiency Bill to cover expenditures in excess of the amount appropriated in the regular appropriation Act.

Forest Research

(e) FOREST MANAGEMENT

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1936.....	\$504,494	\$430,820	\$935,314
Budget Estimate, 1937.....	<u>604,494</u>	<u>- - -</u>	<u>604,494</u>
Net change	<u>100,000</u>	<u>-430,820</u>	<u>-330,820</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase or decrease
<u>Obligated:</u>				
Silvicultural investigations--				
Regular funds	\$220,828	\$250,697	\$295,697	+\$45,000(1)
PWA emergency funds	139,010	1,846	- - -	- 1,846
Emergency relief funds	- - -	319,866	- - -	-319,866
Total	359,838	572,409	295,697	-276,712
Mensuration--				
Regular funds	37,347	49,553	49,553	- - -
PWA emergency funds	10,215	105	- - -	- 105
Emergency relief funds	- - -	16,521	- - -	-16,521
Total	47,562	66,179	49,553	-16,626
Forest regulations--				
Regular funds	58,389	59,237	69,237	+ 10,000(2)
PWA emergency funds	17,215	591	- - -	- 591
Emergency relief funds	- - -	52,443	- - -	-52,443
Total	75,604	112,271	69,237	-43,034
Fire protection--				
Regular funds	71,961	82,139	102,139	+ 20,000(3)
PWA emergency funds	12,986	62	- - -	- 62
Emergency relief funds	- - -	39,348	- - -	-39,348
Total	84,947	121,549	102,139	-19,410
Naval stores--				
Regular funds	24,292	9,919	9,919	- - -
PWA emergency funds.....	2,311	38	- - -	- 38
Total	26,603	9,957	9,919	- 38
Forest genetics--				
Regular funds	- - -	52,949	77,949	+25,000(4)
PWA emergency funds	2,511	- - -	- - -	- - -
Total	2,511	52,949	77,949	+25,000

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase or decrease
<u>Total obligated:</u>				
Regular funds	\$412,817	\$504,494	\$604,494	+\$100,000(A)
PWA emergency funds	184,248	2,642	- - -	- 2,642
Emergency relief funds	- - -	428,178	- - -	- 428,178
Total	597,065	935,314	604,494	- 330,820
<u>Unobligated:</u>				
Regular funds (savings)	1,250	- - -	- - -	- - -
<u>Total (all funds):</u>				
Regular funds	414,067	504,494	604,494	+ 100,000
PWA emergency funds	184,248	2,642	- - -	- 2,642
Emergency relief funds	- - -	428,178	- - -	- 428,178
Total	598,315	935,314	604,494	- 330,820

(A) The increase of \$100,000 in regular funds for 1937 includes:

(1) An increase of \$45,000 for silvicultural investigations, to be expended as follows:

(a) \$25,000 for silvicultural investigations by the Appalachian Forest Experiment Station on methods of cutting and stand improvement in the Piedmont region of Virginia and the Carolinas in which no work is now being done. Methods must be devised to bring the present poorly stocked stands to a state of reasonable productivity, to convert stands of undesirable species to stands of commercially valuable species, and to improve the rate of growth and the quality of the products. The breakdown in agriculture in the Piedmont region and similar areas in the Tennessee valley has resulted in the abandonment of a large percentage of the cultivated land. The loss of surface soil through erosion over much of this area, deep gullyng, and various economic factors make the return of this abandoned and worn-out land to agriculturing during the present century improbable. This region represents the largest area in the United States in which concerted effort to develop sound forest practices has lagged. The social and economic stability of the region depends in a vital way upon proper management of the farm woods and conversion of idle abandoned land into highly productive forest.

(b) \$20,000 for silvicultural investigations by the Central States Forest Experiment Station, to determine the best methods of reproducing upland-oak forests, to obtain rapid and satisfactory restocking of desirable species, and to study related problems in natural regeneration. The upland-oak forests of the Central States, largely farm woods or in small holdings, constitute one of the most important forest types of the country and contribute about one-third of the total annual cut of hardwoods, valued in normal times in excess of \$175,000,000. Included in this type are extensive

areas of the Ohio, Mississippi, and Missouri River drainages on which the establishment and maintenance of a forest cover is of the utmost importance. It is doubtful whether the farm woods or the forests of any other region have been more badly abused or more thoroughly neglected, and in few other forest regions does there exist scantier knowledge of essential forestry measures.

(2) An increase of \$10,000 for forest regeneration investigations by the Appalachian Forest Experiment Station in the field of planting and natural reforestation on approximately 11,000,000 acres of forest or abandoned farm land in the Appalachian region. Definite plans are under way for systematic reforestation throughout this area as the initial step in restoring these badly abused lands to full production. The success of this huge planting program depends on a sound and adequate knowledge of desirable nursery and field technique and of the suitability of the various species chosen. The fact that only 50 percent of the plantations already attempted in this region by a wide variety of agencies (public and private) have been successful indicates that present knowledge is insufficient. The sum requested is needed to get essential investigations under way. No funds are now being expended for this work.

(3) An increase of \$20,000 for fire protection studies. It is desired to undertake work on some of the more pressing features of fire control in the chaparral type. Climatic conditions, terrain, and character of chaparral cover all combine to make fire control in southern California an exceedingly difficult problem. Fires are frequent and costly, although approximately \$1,000,000 is now spent annually in fire control measures, with greater sums to meet such emergencies as the October 1935 fires in the Malibu Mountains near Los Angeles. These control measures are based on a minimum amount of scientific study of the special problems involved, and limited funds have restricted previous work to northern California. The removal of the chaparral cover by fire causes rapid run-off, a loss of irrigation and domestic water, and heavy silt loads in the streams which often brings disaster to the rich valleys, recreation centers, and metropolitan areas below. Work in this region is urgently needed.

(4) An increase of \$25,000 for studies in the genetics of hardwoods by the Northeastern Forest Experiment Station. Forest trees are mongrels. The art of breeding, so long and successfully practiced with many animals and crop plants, is practically unknown with forest trees. Scientific testing and segregation of desirable strains, careful and thorough investigations of the possibilities of hybridization, and similar genetical studies offer great promise as a means of producing faster growing, hardier trees better adapted to the rigors of climate and soil, disease and insect resistant, and capable of furnishing wood and allied products of higher quality. The proposed investigations would be confined to the more important timber and pulp producing species of the Northeastern States, a region containing over 35 million acres of potential forest land. The wide variety of these species offers a particularly promising field of study. Some initial work might well be devoted to breeding strains of poplar which will produce wood of desirable quality for pulp in a shorter time than is possible with native varieties.

WORK DONE UNDER THIS APPROPRIATION

General.--The research carried under this appropriation includes a large group of studies concerned with the problems of establishing and growing forest crops on forest land and of protecting them from fire. Investigations are under way in all important forest regions in the United States. In each region emphasis is being placed upon the most pressing and urgent problems. These investigations are basic to the successful practice of forestry.

Forest-management investigations supply the facts on which sound forestry practices are based. Specifically, they aim to provide the information needed by Federal, State, and private agencies to enable them to reforest, protect from fire, and manage forest land to the best advantage; to insure an adequate future supply of lumber and other forest products; to increase the quality and quantity of the forest products; and to maintain forest cover where needed for recreation and the protection of watersheds and wildlife. They have developed methods being applied on a national scale by the C.C.C. in stand improvement, reforestation, hazard reduction, and fire control. They have disclosed many of the fundamental principles bearing on the location of lookouts, firebreaks, and roads and trails being constructed on the national forests and national parks. They are supplying data on reforestation and forest protection to the Tennessee Valley Authority, and are furnishing basic data on growth, forest management, and naval stores practices to other quasi-public agencies.

These investigations supply information needed in the management and protection of the national forests. The work is being done under the authorization for research in forest management specified in Section 2 of the Act approved May 22, 1928 (45 Stat., 699-702).

These investigations are conducted under the following projects:

Silvicultural investigations.--These furnish basic information necessary to grow forest trees as a crop. As a result of the great diversity of growing conditions, over 50 major forest types and 180 commercially-important forest tree species have to be dealt with. Diversity of ownership and interests further complicate the problems of forest-land management. Prior to the establishment of the Forest Service little was known about the habits, requirements, and possibilities of American forest-tree species and types, and the information available today is far from complete. Specifically, silvicultural investigations aim to determine the distribution, habits, requirements, and ecological relations of the more important forest-tree species and types and how commercially important forest types are to be handled to insure perpetuation of the more desirable features, maximum forest production, sustained yield, and high-quality forest products. Such information is essential to the proper management of the national forests and is urgently needed by State and private forest landowners if forest cover is to be maintained, watersheds protected, and the country's future needs for forest products supplied. This work is now carried on by twelve regional forest experiment stations.

Mensuration investigations.--The object of this project is to prepare for each of the commercially important forest-tree species "volume

tables" showing the average contents of trees of different dimensions and conditions in terms of cubic feet, board feet, cords, and other units; "growth tables" showing the average relation of height, diameter, and volume to age; and, for each of the commercially important forest types, "yield tables" showing the characteristics of the stand at different ages and the yield to be expected under various conditions and methods of handling. There are about 180 forest-tree species and 50 or more forest types of commercial importance in the United States about which such information is needed. In addition, it is necessary to standardize the form and substance of such tables and the technique of their preparation and application, to explore the fundamental laws of form and growth; and to adapt and apply statistical methods to the solution of other American forestry problems. Work is under way in this project at Washington, D. C. and at ten regional forest experiment stations.

Forest regeneration investigations.--This work involves the further development of methods of reforesting denuded forest land. It is estimated that there are 23,000,000 acres of such lands in the United States and in addition 55,000,000 acres of abandoned, submarginal, and other farm land in need of planting. Accordingly, it is necessary to determine for each of a large variety of conditions the species and methods of regeneration to be employed, the best method and season of direct seeding, where direct seeding is possible, the size and class of planting stock to be used, where planting is necessary, the details of nursery practice and the technique of field planting, and ways and means by which natural regeneration can be induced or stimulated. This involves examination of past plantings to determine the causes of success or failure, studies of seed production and dissemination, studies of nursery methods and planting technique, etc. Work of this sort is now under way at nine regional forest experiment stations.

Fire protection investigations.--Work in this field deals with the effects of forest fires and ways and means for their prevention and control. Specifically, studies are being made of ways and means by which forest fires can be prevented, of equipment and methods best suited to detect and control fires under different conditions, of the relation of weather, topography, and fuel conditions to the occurrence and behavior of forest fires, of methods of forecasting periods of high hazard, of the extent and character of the damage resulting from forest fires, season of occurrence, concentration, cause and probability, and of the degree of hazard prevailing in each of the various protection units and forest types involved. Work of this sort is now under way at eight regional forest experiment stations.

Naval stores investigations.--The naval-stores industry has long been important in the South. Early methods of turpentine were crude and inefficient and resulted in the waste of much valuable timber. The object of the investigations now under way is to further improve the technique of turpentine production and the equipment used; to determine the effect of tree size, weather conditions, and surface fires on yield; the effect of various methods of turpentine on tree growth and timber quality, and the best means of combining turpentine and timber production. Work is now under way at the Southern Forest Experiment Station.

Forest genetics investigations.--The segregation or production of desirable strains by breeding experiments, a procedure which has proved

invaluable with crop plants, is practically unexplored in forest trees. Work is aimed at the production of trees of higher rates of growth, more resistant to diseases and insects, of better form, and capable of producing higher-quality forest products. This involves the study and segregation of geographical strains and races, studies of the technique of natural and artificial hybridization, investigations of the genetical constitution and transmission of desirable characteristics, field trials of promising individuals and strains, and similar studies. Work is now under way at the California Forest and Range Experiment Station.

(f) RANGE INVESTIGATIONS

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1936	\$154,435	\$115,336	\$269,771
Budget Estimate, 1937	209,435	- - -	209,435
Net change	<u>+55,000</u>	<u>-115,336</u>	<u>-60,336</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase or decrease
<u>Obligated:</u>				
Grazing management investigations--				
Regular funds	\$ 67,528	\$119,990	\$159,990	+\$40,000(1)
PWA emergency funds	100,885	2,629	- - -	- 2,629
Emergency Relief funds.....	- - -	90,502	- - -	- 90,502
Total	168,413	213,121	159,990	- 53,131
Artificial reseeding--				
Regular funds	1,927	20,145	35,145	+ 15,000(2)
PWA emergency funds	2,565	3	- - -	- 3
Emergency Relief funds.....	- - -	7,780	- - -	- 7,780
Total	4,492	27,928	35,145	+ 7,217
Range forage--				
Regular funds	14,232	14,300	14,300	
Emergency Relief funds	- - -	14,422	- - -	- 14,422
Total	14,232	28,722	14,300	- 14,422
<u>Total obligations:</u>				
Regular funds	83,687	154,435	209,435	+55,000
PWA emergency funds	103,450	2,632	- - -	-2,632
Emergency Relief funds	- - -	112,704	- - -	-112,704
Total	187,137	269,771	209,435	- 60,336
<u>Unobligated:</u>				
Regular funds (savings).....	1,088	- - -	- - -	- - -
<u>Total (all funds):</u>				
Regular funds	84,775	154,435	209,435	+55,000(A)
PWA Emergency funds	103,450	2,632	- - -	- 2,632
Emergency Relief funds	- - -	112,704	- - -	-112,704
Total	188,225	269,771	209,435	- 60,336

(A) The increase of \$55,000 for 1937 includes:

(1) An increase of \$40,000 for grazing management investigations, to be used as follows:

(a) \$20,000 for studies by the California Forest and Range Experiment Station to improve management of the foothill ranges of California. The 10,000 acres of central valley foothills lying between the lower agricultural lands and the higher mountain ranges of California are the key to successful livestock production. The valuable perennial grasses have been destroyed by past abuse. These ranges, unsuited for crop production, originally furnished winter-long or winter-spring grazing for large herds. Now they carry less than half as many livestock and for only two spring months. Costs of production have increased, land abandonment is increasing, and an unsatisfactory social and economic condition prevails. Furthermore, the destruction of vegetation is also seriously damaging watershed values of vast importance to the central agricultural valleys and cities. Correction of the foothill situation would materially relieve difficulties of national-forest summer-range management. With emergency funds the San Joaquin Experimental Range in the heart of the foothill zone in Madera County has been established, and essential physical improvements have been constructed. The limited regular funds available to date, which were drastically curtailed as an economy measure after 1932, have made possible only preliminary studies of the problem. Those, however, have developed some desirable measures for accomplishment under the CCC and other emergency programs. With research facilities available, the proposed increase would strengthen the work under way and assure a satisfactory and aggressive attack on the range-management problems justified by the social and economic welfare of the foothills settlers and of the Great Valley region of California.

(b) \$20,000 for studies by the Pacific Northwest Forest Experiment Station to improve management on the forest ranges of eastern Oregon and Washington. The drought of recent years makes such studies indispensable for national-forest administration. East of the Cascades in Oregon and Washington the 21 million acres of forest ranges which furnish summer feed and the 54 million acres of non-forest ranges which are largely used in winter support 3 million sheep and 700,000 cattle, an industry valued at \$125,000,000. The depletion of range forage has not only brought a crisis in the livestock industry, but it has also impaired the water supply obtained from these lands for extensive irrigation developments. It has endangered conservation of big game and other wildlife. The long, dry summers common in this region greatly complicate management. The problems center chiefly around restoring the worth-while natural vegetation on depleted ranges and management which will aid in stabilizing livestock production and community welfare. While the proposed studies will be concentrated on national-forest ranges, the result will be of considerable value in managing private and public-domain range lands as well. This is the only western region for which some provision for range investigations has not been made.

(2) An increase of \$15,000 for artificial reseeding investigations, to be used for studies of artificial reseeding of forest and other range lands by the Intermountain Forest and Range Experiment Station. The situation has become acute on the 154 million acres of ranges in Utah, Nevada,

southern Idaho, and western Wyoming. Grazing capacities have been lowered 50 to 80 percent through overgrazing and fire. On about 75 million acres, chiefly the drier portions, valuable native forage plants have been destroyed, leaving little nucleus for natural restoration under grazing management. The drought of 1934 accentuated this deterioration and exerted a detrimental influence on the range forage, on the livestock industry, and on watershed values that will be felt for years to come. There has been practically a financial breakdown of the industry, which vitally affects Federal and other loaning agencies. Restoration of the range values is necessary in the agricultural stabilization program.

Research is needed to furnish the scientific foundation for a permanent rehabilitation program, including immediate experimental tests under range conditions of forage plants which have already shown possibilities in other regions or in nursery tests. Preliminary work has shown the necessity of a more adequate attack on the problem if a satisfactory solution is to be obtained. These studies are conducted in cooperation with the Bureau of Plant Industry.

WORK DONE UNDER THIS APPROPRIATION

General.--The work under this appropriation consists of investigations to develop improved methods of management of forest ranges and of other ranges. It is furnishing the basic information necessary for the administration of the range resource in national forests and will aid in developing range management on the public domain. It is also formulating the methods necessary for range improvement, revegetation for erosion control, and other range-land phases of the work of the CCC and unemployment relief projects. The studies of range management to offset destructive drought losses have aided immeasurably in relief and in land-use adjustments. The 884 million acres of forest and untimbered range land represent nearly half the land area of the United States. Sound range-management practices and economical methods of restoring depleted ranges are necessary for the conservation of the resources of range lands and to assure the stability and economic welfare of the livestock industry dependent upon these lands. These investigations alone can supply the required information. The work is done under the authorization for range investigations specified under Section 7 of the Act approved May 22, 1928 (45 Stat. 699-702). The work is conducted under the following projects:

Grazing management investigations.--This work includes investigations to develop methods of managing forest and other range lands that will assure the stability and perpetuation of range-land resources, including forage, watershed, timber, and other range-land values. It includes studies of range forage production to enable management of both the range and livestock that will restore and maintain the better forage plants. It includes the determination of grazing capacity of various range types; ways and means of maintaining and increasing forage and livestock production; of improving methods of handling livestock on the ranges; of controlling losses from poisonous plants; of reducing the fire hazard by grazing; and of harmonizing grazing with watershed protection, timber production, wildlife, and other range-land values.

The studies involve high summer ranges, mainly on national forests, foothill spring-fall ranges, desert winter ranges, and semi-desert year-long

ranges. These studies have aided greatly in the better coordination for profitable use of these important parts of the year-long range livestock operation. They promise additional results urgently needed by the livestock industry and by the Federal and State governments in their emergency programs and in their plans for permanent land use and development.

This work is now conducted at five regional forest and range experiment stations, as follows: California, Intermountain, Northern Rocky Mountain, Rocky Mountain, and Southwestern.

Artificial reseeding investigations.--This work includes investigations to develop suitable artificial methods of restoring the plant cover on seriously depleted range and abandoned dry farms. Studies are under way to determine what native species justify selection for breeding and improvement, the possibilities for adapting native and introduced species for seeding or transplanting, and how they can be most economically reproduced and established on range lands. These studies promise results of vital importance to the range livestock industry and to Federal and State agencies in planning sound land use on a permanent basis.

These studies are being conducted primarily by the Intermountain Forest and Range Experiment Station.

Range Forage Investigations.--This work includes the collection and analysis of information on the identity, distribution, forage and watershed protective, and other values of over 12,000 plant species which inhabit forest and other ranges--information absolutely essential to good range management. It includes the building up of the most complete annotated working herbarium of range plants in the country, a basic feature in meeting the demands for information furnished by these studies and of immense value to all research workers dealing with vegetation characteristics of range and forest lands. This is a continuing study. Range plants and data are collected by all administrative and research personnel of the Forest Service concerned with range management.

(g) FOREST PRODUCTS

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1936.....	\$508,361	\$171,215	\$679,576
Budget Estimate, 1937.....	<u>608,361</u>	<u>- - -</u>	<u>608,361</u>
Net Change.....	<u>+ 100,000</u>	<u>-171,215</u>	<u>- 71,215</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase or Decrease
<u>Obligated:</u>				
Timber harvesting -				
Regular funds.....	\$79,961	\$89,300	\$89,300	- - -
PWA emergency funds.....	3,076	59	- - -	-59
Emergency Relief funds.....	- - -	12,492	- - -	-12,492
Total.....	83,037	101,851	89,300	-12,551
Forest products statistics -				
Regular funds.....	14,696	7,385	7,385	- - -
Pulp and paper -				
Regular funds.....	66,259	94,550	94,550	- - -
PWA emergency funds.....	111,756	2,112	- - -	- 2,112
Emergency Relief funds.....	- - -	52,885	- - -	-52,885
Total.....	178,015	149,547	94,550	-54,997
Strength of wood -				
Regular funds.....	90,661	81,150	143,150	+62,000 (1)
PWA emergency funds.....	81,559	2,895	- - -	- 2,895
Emergency Relief funds.....	- - -	15,409	- - -	-15,409
Total.....	172,220	99,454	143,150	+43,696
Seasoning and physical prop- erties -				
Regular funds.....	41,322	59,920	74,920	+15,000 (2)
PWA emergency funds.....	29,678	769	- - -	- 769
Emergency Relief funds.....	- - -	12,451	- - -	-12,451
Total.....	71,000	73,140	74,920	+ 1,780
Chemical composition -				
Regular funds.....	60,281	55,360	55,360	- - -
PWA emergency funds.....	10,448	271	- - -	- 271
Emergency Relief funds.....	- - -	14,917	- - -	-14,917
Total.....	70,729	70,548	55,360	-15,188
Wood preservation -				
Regular funds.....	85,203	77,286	100,286	+23,000 (3)
PWA emergency funds.....	54,714	1,417	- - -	- 1,417
Emergency Relief funds.....	- - -	35,256	- - -	-35,256
Total.....	139,917	113,959	100,286	-13,673
Wood structure -				
Regular funds.....	47,550	43,410	43,410	- - -
PWA emergency funds.....	2,566	66	- - -	- 66
Emergency Relief funds.....	- - -	20,216	- - -	-20,216
Total.....	50,116	63,692	43,410	-20,282

<u>Total obligations:</u>				
Regular funds.....	485,933	508,361	608,361	+100,000
PWA emergency funds.....	293,797	7,589	- - -	- 7,589
Emergency Relief funds.....	- - -	163,626	- - -	-163,626
Total.....	779,730	679,576	608,361	- 71,215
<u>Unobligated:</u>				
Regular funds (savings).....	1,297	- - -	- - -	- - -
<u>Total (all funds):</u>				
Regular funds.....	487,230	508,361	608,361	+100,000 (A)
PWA emergency funds.....	293,797	7,589	- - -	- 7,589
Emergency Relief funds.....	- - -	163,626	- - -	-163,626
Total.....	781,027	679,576	608,361	- 71,215

(A) The increase of \$100,000 in regular funds for 1937 includes:

(1) An increase of \$62,000 for strength of wood investigations, to be used to develop prefabricated units and structural improvements as an aid to low-cost housing. Comprehensive tests to determine the strength, rigidity, and other properties of units and assemblies of units are involved.

(2) An increase of \$15,000 for wood seasoning and physical properties investigations, to minimize the effects of shrinkage through new design and improved methods of seasoning as an aid to low-cost housing.

(3) An increase of \$23,000 for wood preservation investigations, to develop improved methods of fireproofing, painting, insulation, and decay-resistance applicable to low-cost housing.

The combined increase under the three projects above is recommended to provide for an integrated study for the development of low-cost housing. A better house at a reduced cost would be a major factor in furthering the Administration's housing program to reduce unemployment and to revitalize the construction industry. Rural building is at a very low ebb; new construction has been practically halted, and maintenance has also been sadly neglected.

In these fields wood has always been the preeminent building material. While many new and interesting materials are being suggested for modified structures, wood offers superior advantages from the standpoint of cheapness, availability, ready workability, natural insulating quality, and consumer acceptance. But, if wood is to hold this field of utility, structural research must show the way to more efficient construction, better design and assembly methods, and better selection, handling, and care of the material. Modern engineering efficiency and high costs of material will no longer permit the lavish use of material to obtain suitable strength.

The most promising field for improvement is through the adoption of new structural systems adapted to the factory production of prefabricated units suitable for rapid field assembly and also adapted to the most rational

utilization of low-cost structural materials. The Forest Products Laboratory has a great reservoir of information fundamental to such a project and has already started on the development of a prefabricated wood-house system. The basis is shop-fabricated floor, roof, and wall panels of plywood glued to light structural soundness of the system. What is needed is the further working out and practical demonstration of many structural details and the possibilities of improved modifications of traditional methods. Both lines call for the correlated study of allied problems such as painting, fireproofing, insulating, shrinkage control, and decay and insect protection.

Modern tendencies in design and construction bring these correlative problems to the forefront as never before. The use of relatively thin sheets of plywood for walls, thinner by far than was deemed possible in the past, calls for insulation of proven efficiency. This means actual heat-loss tests of full-scale panels. The use of plywood glued to a structural framework demands glues and gluing technic that will insure adequate performance over many years. The cause of unusually early paint failures through blistering, peeling, or other forms of disintegration must be found and remedied, and the life of the usual paint coating extended. Fireproofing in low-cost housing requires the development of inexpensive, durable, and effective fireproofing treatments and coatings. Progress made in the past has not brought the cost of such treatment within reach of the housing industry. Allied with this is the need to determine how fire hazard may be reduced by changes in design and construction. Also in all parts of a house, and in other structures as well, shrinkage control is important. Means for minimizing the effects of shrinkage through design and the more fundamental phase of treatment to minimize shrinkage of wood should both be aggressively studied.

WORK DONE UNDER THIS APPROPRIATION

General.--Forestry is not only concerned with producing timber but in its efficient utilization by satisfied consumers. The foundation of efficient utilization is research in forest products - an integral part of present-day forestry. While the importance of such services as stream control, recreation, and the prevention of erosion may vary with the different regions, there is involved to a certain extent in each region and predominantly in some the problem of ultimately using the mature timber. The far-reaching forestry program of the Administration is designed to increase the production of timber on both public and private lands. The program will be far more successful if it provides for the fullest and most effective utilization of the timber crop as it becomes ready to harvest.

Upon the efficient production and marketing of forest goods on a steadily increasing scale depend permanent jobs for several million wage earners; permanent tax revenues and fiscal stability for rural communities throughout 600 million acres of forest lands; and adequate return on billions of dollars of public and private investment in forests and forest industries.

Forest products research is necessary to safeguard full returns from the silvicultural improvements on public lands under the Emergency Conservation Work; from private forest lands under sustained yield management; from the ruralization of forest industry in the Tennessee Valley; and from many Resettlement Administration projects. It is especially necessary to the Administration's vast housing and home-renovation program which will require wood as a major construction material.

The bulk of the work in forest products research is centered at the Forest Products Laboratory at Madison, Wis., with some associated work at forest experiment stations and at Washington, D. C. Since its establishment in 1910 the Laboratory has become the outstanding institution of its kind in the world. Conservative estimates place the annual savings to users and producers alone through application of laboratory findings at a figure at least 20 times the cost of operation. Only a small part of the needed work in forest products has been done. There can be no question of the vital part of forest products investigations in the whole forestry program or of the urgency of continuing the work under way.

The work is done under the authorizations for forest products investigations of domestic woods and for tropical woods specified under Section 8 of the Act approved May 22, 1928 (45 Stat., 699-702). It is conducted under the following projects:

Timber harvesting and conversion investigations, including costs of logging and milling trees; design of logging machinery; selection and grading of lumber; and wood-use development.

Millions of acres of cut-over lands barren of growing stock in the South, the East, the Lake States, and of late in the West are the results of the general belief among timber operators that maximum returns necessitated felling all trees of the desirable species that would cut out any standard lumber. The owner of forest land is now becoming aware that practically his only chance of low-cost and high-yield continuous production is to evaluate returns on the basis of analytical data, such as the Forest Service has recently been making available, which dictate removal of the larger trees and leaving the smaller trees to grow and maintain the stand.

Under prevailing practice, the timber left, or that has restocked the cut-over areas, has been largely of so-called inferior species - aspen and birch in the Lake States; beech and birch in the East; elm, hackberry, tupelo, and low-grade oaks in the South; and white fir, western larch, and western hemlock in the West. To enable the removal of these species and thereby to improve the forest, by putting them to use on the basis of their best utility values, is a major forestry problem and a feature of this project. This is coupled with the problem of converting the present 50 percent waste in the woods and at the mill into marketable commodities.

Lumber is separated at the mill into classes or grades on a basis of the number, condition, and size of visible defects. Rules for grading have become more and more complicated, with resultant difficulties and misunderstanding between manufacturers and users. The Forest Products Laboratory has played a prominent part in various movements to improve and simplify grading rules. Federal specifications prepared by the Forest Service govern the purchase of lumber by the Government.

Forest-products statistics, including production, consumption, and distribution of forest products.

Information as to the production, consumption, and distribution of lumber and other forest products is essential to the orderly manufacture and marketing of forest products; to the maintenance and proper distribution of

adequate and suitable supplies of raw material for wood users; and as a basis for planned forest production. These data form the necessary economic background needed by Federal, State, and private agencies dealing with forest, industrial, and social programs and policies and are basic to forest-economic investigations of the Forest Service.

The work is handled by statistically trained foresters in the Washington office and at several of the western forest experiment stations. Under a cooperative agreement with the Bureau of the Census, data are obtained from the forest industries concerned by a canvass and are then compiled, analyzed, and published.

Strength of wood investigations, including strength and related properties of wood and improvement in design of structures, containers, and other wood products.

Besides its importance to the average citizen and home builder, this project has a vital relation to the utilization of timber and the liquidation of forestry investments. Building construction normally consumes more than 60 percent of our annual lumber production, a large proportion going into small houses. In recent years, however, the use of wood in buildings in comparison with other materials has shown a great decline, chiefly because lumber in construction does not reflect the modern trends toward lower costs in the handling and assembly of other materials.

Improvements in the engineering of wood construction such as are now under study at the Forest Products Laboratory to make possible the building of simple and inexpensive but thoroughly satisfactory wooden houses would mean more desirable homes for families with small resources as well as new life in the construction industry. New developments in heavy timber construction which are now under investigation also promise a great advance in engineering economy. About one-sixth of the total lumber production is used for boxes and crates. Improvements in these and other containers benefit the consumer through their effect on the cost of shipping the products he uses.

The project involves strength tests of the clear wood of all commercially important species, both from virgin and second-growth stands, in various forest regions; investigations of factors affecting properties, such as defects, moisture content, and weight; appraisal of the effect of preservative, seasoning, and other processes; and determination of the efficiency of nails, bolts, screws, glues and other mediums for joining wood members or parts.

Pulp and paper investigations, including studies of the suitability of various woods for pulps and papers and the development of new and improved manufacturing processes.

The value of pulp and paper products produced annually in the United States is, roughly, \$1,000,000,000. The domestic consumption of wood for paper is approximately 6 1/2 million cords (about 12 percent of which is imported), valued at \$50,000,000. In addition, wood pulp and paper are imported to the equivalent of about 6 million cords of wood.

The use of wood for pulp far exceeds that of any other raw material and, although the quantity thus used constitutes only about 5 percent of the total timber cut of the United States, it is of large importance by virtue of being a profitable outlet for a class of timber and for wood wastes having practically no other value except as fuel. Furthermore, the removal of much of this material (as thinnings, etc.) is a factor in good forestry practice in growing the timber crop.

Search is constantly going forward for new or modified processes that will make it feasible to use woods other than spruce which now supplied 70 percent of our pulp and paper requirements, and definite progress has been made. As a result of work by the Forest Service and other organizations, much prominence has recently been given in the press to the southern pines as a possible source of newsprint. This work on southern pine will be continued, as will the work to find a process adapted to pulping Douglas fir, especially in the form of woods and mill waste, of which enormous quantities are available, and also the work to check stream pollution by developing methods of recovery and reuse of waste cooking liquors.

Wood seasoning and physical properties, including studies of kiln-drying, air-seasoning, and storage of lumber; moisture content of wood in use; seed-extraction equipment; and insulation of building.

Losses resulting from lack of proper seasoning methods or from poor storage, handling, and construction practices amount to more than \$100,000,000 annually. They are made up of a variety of items, including the entire loss of certain species which can not now be seasoned; the loss of footage and value through degrade resulting from improper seasoning methods; the loss in value of fabricated products and structures by damage from swelling, shrinking, and warping; and the losses of markets due to the user's dissatisfaction with imperfect articles and structures. The reduction of these losses in whole or large part is the goal of the Laboratory's work.

Kiln-drying principles and methods developed at the Laboratory have revolutionized the kiln-drying industry and are in wide use. More than half the kilns built in the United States in the last five years are of the internal fan type developed at the Laboratory.

Chemical composition and wood-utilization investigations, including studies of chemical composition and utilization of wood; of physical-chemical structure and properties; and in the development of improved and new chemical processes and products.

Wood constitutes the largest and most convenient source of cellulose, one of our most important raw materials. Chemical means must be resorted to in isolating the cellulose because the lignin with which it is surrounded resists all other methods. Because it is an abundant and inexpensive material, science confidently looks forward to the conversion of cellulose into other important commodities in addition to paper, artificial silk, fabric, cellophane, lacquers, and plastics for which it is now used. The lignin with which cellulose is associated comprises one-quarter of the wood but, because of its chemical complexity, no method of utilizing lignin has been devised. As a consequence it is wholly wasted in the pulping processes. Since both

cellulose and lignin must be isolated by chemical means and converted into other commodities by chemical processes, the economic importance of a thorough knowledge of their chemical nature can hardly be overestimated.

The chemical composition of wood substance, the arrangement of constituents parts in the wood cell, the size and spacing of the cells, and the variation of all such characteristics according to species and growth conditions are intrinsic factors which determine the useful properties of wood in mass. The aim of the work under this project is to bring about a scientific understanding of these factors, which is essential to the best results in growing the wood, in its selection, its seasoning and handling, its impregnation with preservatives, its use in construction, and its conversion into pulp and other products. The work involves the conversion of waste wood into useful and valuable materials, such as wood-distillation products, grain alcohol, moulded board, and other derived products.

Wood preservation investigations, including studies on wood treatments to increase resistance to decay, insects, and fire; and coatings, paints, glues, and laminated construction.

Rail transportation costs depend to a considerable degree upon economy and efficiency in the use of wood for railway ties, bridges, poles, piling, and other construction. The railroads use nearly one-fifth of the total annual lumber production and spend over \$100,000,000 per year for wood and much larger sums for its treatment and installation. Preservative treatment has greater influence than any other factor in reducing annual costs for wood used by railroads. Likewise, telegraph, telephone, electric-light, and power costs are influenced by the efficiency obtained in the use of poles and other wood in the distribution systems.

Fire losses in wooden structures constitute an enormous loss that can be reduced by the discovery of cheap and effective fireproofing methods. The cost to home owners of maintaining the paint on their property is estimated at \$375,000,000 annually. The strength and durability of glue joints have a profound influence upon the service given by glued products for which the public pays about \$1,000,000,000 per year. Losses from defective gluing are heavy. The performance of wood in floors, furniture, house trim, aircraft, and numerous other uses is impaired by shrinking and swelling with moisture changes, the prevention of which is of the highest importance in maintaining markets for wood. The work under this project is largely of direct value to the consumer.

The work involves experiments to improve wood processes; service records of treated material subjected to conditions of actual usage; records of the lasting qualities of various paints applied to wood panels of different species and exposed in various regions; tests to determine the fire resistance of both small pieces subjected to fire-resistant treatments and of full-sized structural units; and the improvement of glues and gluing methods.

Wood structure and growth investigations, including the microscopic identification of wood; the relation of growth conditions to wood quality; the relation of structure to properties; and the formation of resin.

Knowledge of wood structure is essential in identifying the thousands of wood and pulp samples submitted by Government officials and the public. Such identifications aid in selecting the right kind of wood for a given purpose and in adjusting disputes between buyer and seller, and have proved very helpful in criminal cases involving wood.

Knowledge of the relation of growth conditions and structure to properties makes it possible to overcome unfounded trade prejudices and to broaden the uses of wood; to safeguard the public against defective material, and so to increase the value and efficiency of wood in service. The information obtained is of value in selecting species for reforestation, in the profitable use of marginal agricultural lands and overflow lands for producing future forest crops, and in controlling the growth factors which influence the properties of the wood formed.

(h) FOREST SURVEY

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1936.....	\$250,000	\$62,450	\$312,450
Budget Estimate, 1937.....	250,000	- - -	250,000
Net change.....	<u>- - -</u>	<u>-62,450</u>	<u>- 62,450</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Decrease
Forest surveys-				
Regular funds.....	- - -	\$250,000	\$250,000	- - -
PWA lieu funds.....	\$105,628	12,915	- - -	-\$12,915
PWA emergency funds.....	136,475	1,849	- - -	- 1,849
Emergency Relief funds.....	- - -	47,686	- - -	- 47,686
Total.....	242,103	312,450	250,000	- 62,450

No increase over the appropriation for the fiscal year 1936 is recommended for 1937 since the 1936 appropriation of \$250,000 was the maximum authorized for forest surveys by Section 9 of the Act approved May 22, 1928.

WORK UNDER THIS APPROPRIATION

General.---The Forest Survey includes an authoritative nation-wide inventory of the extent, location, and condition of forest lands; the quantity, kinds, quality, and availability of timber now standing on these lands; the rate of depletion through cutting, fire, insects, disease, and other causes; the current and probable future rate of timber growth, and the productive capacity of our forest area; and the present and probable future requirements for forest products in the different parts of the country by all classes of consumers, including many major industries. It also includes analyses of the relation of these findings to one another and to other economic factors as a basis in formulating policies, principles, and plans of forest land utilization.

It involves both field surveys and the compilation of existing data from a great variety of sources.

The Survey is obtaining fundamental information long needed and now vitally essential to the most efficient prosecution of important measures of the Administration dealing with conservation and land use, such as the effectuation of forest conservation and sustained operation of forest industries, the retirement of submarginal land from agricultural use, expanded public acquisition of land for forest purposes, a permanent Civilian Conservation Corps program, the Tennessee Valley development, and the establishment of permanent forest communities. At the present rate of progress the accumulation of data is lagging far behind the demand.

The work is conducted mainly in the regions served by the following forest experiment stations:

Appalachian Forest Experiment Station. - Approximately 50,000,000 acres of forest land, including some of the finest hardwoods in the country, make this one of the most important forest regions in the United States. Less is known of the economic significance and the potentialities of the Appalachian forests than of any other important forest region. Its closeness to large consuming centers, the wide variety of products obtainable, and the watershed value of its forests are some of the reasons why factual data which will be obtained by the Forest Survey are vitally necessary for the formulation of sound forest and economic progress. Work here is commencing this fiscal year.

California Forest and Range Experiment Station. - Limited Federal funds have restricted the work to the preparation of a forest cover type map. The other phases of the Survey will follow as rapidly as funds become available.

Lake States Forest Experiment Station. - The project in this region involves the coverage of nearly 60,000,000 acres of forest land in cooperation with Michigan, Wisconsin, and Minnesota, which have already contributed a great deal of their own effort to the project. The work is incomplete.

Northern Rocky Mountain Forest and Range Experiment Station. - This region includes the only significant remaining supply of white pine in the United States. Because of the special national, as well as regional, importance of the forests in this territory, the Federal Government is spending large sums in their protection against fire and forest diseases. The work is in its early stages.

Pacific Northwest Forest Experiment Station. - Field work has been completed for the inventory phase in the Douglas-fir belt, which has the greatest remaining supply of virgin timber, and where exists the most important and unsatisfactory economic situation as to forest industries in the United States. The Survey will supply basic information urgently needed in effectuating sustained production in that highly important and critical region; in national-forest administration; and in the formulation of land-use plans by many public commercial, and other local agencies. The work ahead in the Douglas-fir belt is the analysis, interpretation, and formulation of principles for economic units and for the region as a whole. Field inventory work in the pine types in eastern Washington and Oregon is under way.

Southern Forest Experiment Station. - This region includes the entire southern pine naval stores district, the bulk of the southern pine lumber-producing stands, and the chief hardwood-producing area of the Nation, all of which should be covered by the Survey. Inventory field work is progressing rapidly, but the analysis and interpretation of the data have barely commenced.

(i) FOREST ECONOMICS

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1936	\$73,295	\$30,576	\$103,871
Budget Estimate, 1937	129,295	---	129,295
Net change	<u>+56,000</u>	<u>-30,576</u>	<u>+25,424</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase or decrease
<u>Obligated:</u>				
New public domain --				
Regular funds.....	\$16,671	\$18,680	\$34,680	+\$16,000(1)
Emergency Relief funds.....	---	20,990	---	- 20,990
Total	16,671	39,670	34,680	- 4,990
Private forestry --				
Regular funds.....	29,505	48,370	88,370	+ 40,000
PWA Emergency funds.....	3,098	43	---	- 43
ER funds.....	---	9,543	---	- 9,543
Total	32,603	57,956	88,370	+ 30,414
Stumpage, log, and lumber prices				
Regular funds	4,345	6,245	6,245	---
<u>Total obligations:</u>				
Regular funds.....	50,521	73,295	129,295	+ 56,000(2)
PWA Emergency funds.....	3,098	43	---	- 43
ER funds.....	---	30,533	---	- 30,533
Total	53,619	103,871	129,295	+ 25,424
<u>Unobligated:</u>				
Regular funds (Savings).....	5	---	---	---
<u>Total (all funds):</u>				
Regular funds.....	50,526	73,295	129,295	+ 56,000(A)
PWA Emergency funds.....	3,098	43	---	- 43
ER funds.....	---	30,533	---	30,533
Total	53,624	103,871	129,295	+ 25,424

(A) The increase of \$55,000 in regular funds for 1937 includes:

(1) An increase of \$16,000 under the project "New Public Domain Investigations" for studies by the California Forest and Range Experiment Station of the social and economic problems involved in readjustment of forest land use in the foothill zone of California.

This transition zone between the valley and the mountain, much of which was originally forested, embraces some 40 million acres. Destructive lumbering, fires, and excessive grazing have transformed a large part of it from a highly productive to a virtually unproductive condition. The timber has largely been replaced by worthless brush, the forage has been badly depleted, and the flow of water, which is so necessary for successful agriculture in the valleys, has become irregular and uncertain. As a result, population and livestock industries are in a precarious condition, tax revenues have declined, and many communities are in distress. The purpose of this study would be to ascertain the facts which should serve as a basis for planning desirable readjustment in the ownership and use of the forest land. This is especially important in view of the proposed program for the development of the Sacramento-San Joaquin Valley.

(2) An increase of \$40,000 under the project "Private Forestry Investigations", for studies of economic organization to increase yield, income, and rural social benefits dependent on farm woodlands and other small holdings.

The value of forest products from about 125 million acres of farm woodlands exceeded \$242,000,000 in 1930. In all regions farm woodlands are deteriorating and marketing methods are ineffective in obtaining adequate returns from this important element of farm property. The purpose of this study is to develop simple methods of economic organization that will give farmers the benefit of collective action in forest management, utilization, and disposal of forest products and to improve the quality and quantity of farm-woodland production. The problems are common to over 2,000 counties east of the Great Plains region and in certain western counties. The project is of especial importance in paving the way for diverting the surplus rural labor from production of highly competitive annual crops to production of lumber and other forest products which are in steady demand in rural communities and command a ready market in nearby urban centers. The study will be conducted by the following forest experiment stations:

Central States Forest Experiment Station.-- With the depletion of the virgin timber supplies, wood-using industries are turning more and more to second growth on farm woodlands for raw material. The steady local demand for timber in the agricultural sections of the Central States provides very favorable opportunities for profitable forestry. Studies of the organization of owners for cooperative marketing and management and the development of sound silvicultural practices in order to maintain farm woodlands in productive condition are included.

Southern Forest Experiment Station.-- One-third of the forest area of the South is in farm woodlands, which, if managed under a plan of sustained production, will enable farmers to market a sustained supply of woodland products and thereby contribute materially to their social and economic security.

Present existing cutting, utilization, and marketing practices are inefficient. Yield is far below its potential level. A basic aim of the study will be to enhance the value of woodland products through collective action which will result in a sustained cash income. The increased income which can be obtained from the sale of woodland products will be of particular importance in the South because of the unfavorable agricultural conditions, especially as effected by the cotton situation.

WORK UNDER THIS APPROPRIATION

General.--- This is a series of studies which, in correlation with other forest research, strike directly at the efficient and economical ways of attaining the important forest land-use objectives included in the Administration's comprehensive recovery program.

The work is done under the authorization for investigations in forest economics specified under Section 10 of the Act approved May 22, 1928 (45 Stat., 699-702). These studies are conducted under the following projects:

New public domain investigations.--- A "new public domain" is being created by the abandonment and reversion to public ownership through tax delinquency of cut-over forest land. This is a study of the extent and trends of reversion in different regions, the feasibility of using the land for forest purposes, the desirable balance of ownership between Federal, State, and other public agencies, and the methods and aims of public administration and use. These investigations are conducted by the following forest experiment stations:

(a) Lake States Forest Experiment Station.--- The abandonment of cut-over land has reached a more acute stage in the Lake States than in any other region. At least 20,000,000 acres of land have reverted to public ownership or are suffering under long-term delinquency. This study, prosecuted in cooperation with other Federal, State, and local agencies, is already supplying information and advice of vital importance to the formulation and application of constructive land-utilization plans, including the correlation of agricultural and forest use, the greatly expanded program of Federal acquisition, and the development of State and county forest systems in the Lake States.

(b) Pacific Northwest Forest Experiment Station.--- The destructive cutting of privately owned forest lands in Oregon and Washington, the serious and increasing extent of tax delinquency, forfeiture, and abandonment of these lands, and the attempts to settle them for agricultural purposes have produced deplorable physical, economic, and social results. The instability of forest-land ownership is increasing; precipitate losses are taking place in tax base and tax receipts essential for the maintenance of public service; and industries and the opportunity for labor are being lost. Added to these factors is the continued and uncontrolled practice of placing settlers on forest lands unsuited for agricultural purposes and remote from established roads, schools, and other advantages of community life, where fire is a hazard to life and property and where their presence adds to the burden of property owners, taxing jurisdictions, and social agencies. No legal control over these practices and no reasonably lasting solution of these problems are possible unless and until local awareness takes place, a delineation between forest and other lands is made, and ways of stabilizing ownership, employment, and social betterment are developed.

(c) Southern Forest Experiment Station.-- The acreage of forest land forfeited to public ownership through nonpayment of taxes has increased to such an extent during recent years as to constitute a major problem in the fiscal affairs of the several States and their minor divisions and an even greater problem in forest land-use planning. The analysis of the causes and the determination of the extent, of this situation is one of the basic requirements in the development of a sound forest land-use policy. Data already available from this study are in demand by the A.A.A., State planning boards, State foresters, and other agencies and individuals. These agencies, together with State and local governments, are cooperating.

Private forestry investigations.-- Current work includes a search for ways and means of replacing the customary destructive methods of exploitation with the practice of forestry, including sustained yield management on privately owned lands. This requires appraisal of the economic factors in various forest regions that are obstructing forestry practice and the formulation of new operating methods and other means, including needed public assistance, that will aid in overcoming these obstacles. The work also includes studies of the financial aspects of forestry, especially of the costs and returns from timber growing, to determine for various forest regions where and under what economic conditions forestry may be successfully practiced; and of the potential contributions of forestry to community stability and prosperity. These investigations are being conducted mainly by the following forest experiment stations:

(a) Pacific Northwest Forest Experiment Station.-- The Douglas-fir belt includes one-third of our remaining saw timber. Three-fifths is in private ownership and characterized by destructive utilization practices; cut-over land is often rendered completely unproductive by successive burning; sawmill capacity is far in excess of sustained yield capacity or market requirements. Altogether, it represents the most serious and baffling "sore spot" in the Nation's forest economic situation. This study is furnishing vital information as to practical and profitable means, including revolutionary changes in the mechanics of logging and in methods of cutting, of converting the industry to sustained yield management.

In the Ponderosa pine belt, present operating practices are reducing potential rates of annual growth from as high as 200 to as low as 10 to 25 board feet per acre. This study will provide basic information needed in fixing diameter cutting limits, spacing of railroad spurs, skidding distances, and desirable types of machinery; in brief, information necessary for the elimination of wasteful and uneconomic practices and for the stabilization of lumbering operations, communities, and labor conditions.

(b) Southern Forest Experiment Station.-- Most of the 200 million acres of forest land is privately owned. Because of its enormous potential productive capacity and favorable location, the region is the logical source of timber for much of the eastern United States and for export trade. The forest resource is the basis of the world's largest naval stores industry. But forest productivity has seriously deteriorated, and industry has correspondingly suffered, as the result of uneconomic practices. If the forest products industries are to be rehabilitated, the practice of forestry must be installed on private land and forest productivity must be restored.

An analysis of the cost of growing timber and the returns to be derived therefrom--in other words, the conditions under which private forestry will be practicable--is especially needed. This study is designed to supply this information. The development of private forestry is of the utmost importance, not only from the standpoint of the region itself because of the extent to which local economy must be based upon the forest resource, but to the whole eastern United States.

(c) Northeastern Forest Experiment Station.-- The purpose of this work, which was commenced during the fiscal year, 1936, is to obtain the technical basis for and to help develop to the point of self-support cooperative timber production, manufacturing, and marketing enterprises, particularly for farmers and other small owners. Unrestricted cutting of timber on farm woodlands, largely prompted by heavy demand from the adjacent industrial population, have depleted the available timber to a point where many industries have been forced to move to other regions. Returns to woodland owners from the sale of timber are relatively low and realized only once in several decades. Manufacturing and marketing of forest products is generally on a haphazard and uncertain basis. Specifically, the procedure is to study the possibilities of cooperative management of small timber holdings, particularly farm woodlands, in typical natural units, with the belief that proper forest management methods will permit a regular and dependable source of income to farmers and others. Studies in methods of cutting, transportation, manufacturing, and marketing are also included.

Stumpage, log, and lumber price investigations.-- Stumpage and log prices are important elements in the production cost of lumber and other wood products. They are not compiled on a nationwide basis by any other agency. They are necessary in other important economic studies and influence the formulation and development of national, State, and private forest programs and are of value to the industry.

Current work includes the compiling and analyzing of price data for previous years from all available sources; the development of price trends and indexes; the comparison with price trends and indexes of important agricultural crops; the compilation of current price data; and the publication of an annual statistical bulletin. Basic data are collected annually through a cooperative agreement with the Bureau of the Census. Work to date has been confined mainly to stumpage and log prices. Work on lumber prices is as yet fragmentary because of limited facilities and funds. This is an important and continuing project. The work is done mostly in Washington.

(j) FOREST INFLUENCES

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation Act, 1936:			
Investigations	\$99,152(a)	\$178,405	\$277,557
Shelterbelt work	---	1,990,958	1,990,958
Total, 1936	99,152	2,169,363	2,268,515
Budget Estimate, 1937:			
Investigations	99,152	---	99,152
Shelterbelt work	1,000,000	---	1,000,000
Total Estimate, 1937 ...	1,099,152	---	1,099,152
Net change	+1,000,000	-2,169,363	-1,169,363

(a) Allotment from \$281,362 appropriation for "Soil-Erosion Investigations", carried under the "Miscellaneous" section of the Agricultural Appropriation Act, 1936, but estimated under this heading in the Budget for 1937.

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase or decrease
1. <u>Investigations:</u>				
Forest cover:				
Regular funds	---	\$38,370	\$38,370	---
PWA lieu funds	\$32,640	2,311	---	- \$2,311
PWA emergency funds	29,763	434	---	- 434
Emergency Relief funds	---	17,121	---	- 17,121
Total	62,403	58,236	38,370	- 19,866
Brush and herbaceous cover:				
Regular funds	---	60,782	60,782	---
PWA lieu funds	30,380	2,311	---	- 2,311
PWA emergency funds	144,476	3,776	---	- 3,776
ER funds	---	152,452	---	-152,452
Total	174,856	219,321	60,782	-158,539
Shelterbelt research:				
Regular funds	---	---	---	---
PWA emergency funds	345	---	---	---
Total	345	---	---	---
Total, Investigations:				
Regular funds	---	99,152	99,152	---
PWA lieu funds	63,020	4,622	---	- 4,622
PWA emergency funds	174,584	4,210	---	- 4,210
ER funds	---	169,573	---	-169,573
Total	237,604	277,557	99,152	-178,405

PROJECT STATEMENT -- Continued

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase or decrease
2. <u>Plains shelterbelt project:</u>				
Regular funds	---	---	\$1,000,000	+\$1,000,000(1)
Loans and Relief in Stricken Agricultural Areas	\$848,979	---	---	---
Emergency Relief funds	---	\$1,990,958	---	-1,990,958
Total, shelterbelt	848,979	1,990,958	---	- 990,958
3. <u>Total, Forest Influences:</u>				
Regular funds	---	99,152	1,099,152	+1,000,000(1)
PWA lieu funds	63,020	4,622	---	- 4,622
PWA emergency funds	174,584	4,210	---	- 4,210
Loans and Relief in Stricken Agricultural Areas	848,979	---	---	---
Emergency Relief funds	---	2,160,531	---	-2,160,531
Total	1,086,583	2,268,515	1,099,152	-1,169,363

Under this item it is proposed to continue the allotment of \$99,152 made in 1936 from the appropriation "Soil Erosion Investigations" for studies on the relation of forest brush and herbaceous cover to watershed management.

(1) The increase of \$1,000,000 will be used to continue during 1937 the Plains shelterbelt project, which has heretofore been financed from emergency funds.

The shelterbelt project involves a comprehensive tree-planting program, largely in the form of strips about fields and farmsteads in the Plains region. The planting is to be confined largely to a 100-mile-wide strip through North Dakota, South Dakota, Nebraska, Kansas, and Oklahoma and into northern Texas. It had for its immediate object aid to drought-stricken farms and unemployment relief. It is also designed to improve the physical conditions of living, aid in stabilizing rural population, develop needed recreation areas, establish a protective cover for upland game and other wild life, and make an area of over 70,000,000 acres (which includes more than one quarter million established farm units), a better place in which to live. It contemplates a major contribution to agriculture in the Plains States.

The Forest Service in 1934 was given the task of carrying out the plan for the shelterbelt. As a basis for general orientation, the Service, in cooperation with many other agencies, immediately launched a comprehensive survey of the Plains regions. This involved a study of the climate, soils, native vegetation, water resources, and past planting experiences of farmers and others in the region. This study defined the possibilities of shelterbelt planting, determined the location of the shelterbelt zone, and established a scientific basis on which a sound program of tree planting could be inaugurated immediately. A publication outlining the possibilities of shelterbelt planting has been prepared.

Field operations closely followed the survey. Although limited amounts of planting stock were obtainable in 1934, a sufficient number of trees was available to plant some 125 miles, or 2,000 acres, of field shelterbelts. These shelterbelts are strips approximately 8 rods wide. A mile of such shelterbelts has an area of 16 acres. In addition, 5,100 acres of windbreaks were planted around farmsteads. All this reforestation work has been developed cooperatively with the States and the local authorities. The area planted (7,100 acres) probably exceeds the total area planted in the Plains region in the past decade. Widespread success has attended this work.

Seedlings are now being grown in nurseries developed for this project, and about 15,000 acres have been selected and about 14,500 additional are in process of selection for planting in the spring of 1936. The area to be planted includes some 1,400 miles of field shelterbelts and 6,000 acres of windbreaks about farmsteads. Requests from local farmers and communities for shelterbelt planting are far in excess of present available supplies of plant stock.

Continuity of planning and execution is essential to the success of this forestry project. The work should therefore be continued as a regular Departmental activity. Such a recognition of this policy is needed in view of the fact that trees must be grown in one fiscal year to be planted one or more years later.

CHANGES IN LANGUAGE

The item "Forest Influences" provides, first, for the continuance of the shelterbelt program which has been financed from emergency funds; and, second, for the continuance of that portion of the activities heretofore carried under "Soil Erosion Investigations," in the miscellaneous section of the Agricultural Appropriation Act, for which the Forest Service has been responsible. In the Agricultural Appropriation Act for 1936 a miscellaneous appropriation of \$281,362 was provided under this item. In accordance with the provisions of sec. 5 of the Soil Conservation Act of April 27, 1935 (Public No. 46, 74th Congress), the portion of this appropriation which had been previously allotted to the Bureau of Agricultural Engineering and Chemistry and Soils for investigative work on agricultural land, was transferred to the Soil Conservation Service and the remainder (\$99,152), which had previously been allotted to the Forest Service, was continued in that Service for watershed investigations on forest and range land. For 1937 it is now proposed to provide for the latter investigations under a separate proposed new sub-appropriation item, "Forest Influences."

The proposed new language reads as follows:

"Forest influences: For necessary expenses in connection with the establishment, maintenance, and improvement of shelterbelts and other tree and shrub plantings in the plains region, including cooperation with individuals and public and private agencies, \$1,000,000; and, in addition, \$99,152 for investigations at forest experiment stations and elsewhere, for determining the possibility of increasing the absorption of rainfall by the soil, and for devising means to be employed in the preservation of soil, the prevention or control of destructive erosion, and the conservation of rainfall on forage or range lands; in all, \$1,099,152."

WORK DONE UNDER THIS APPROPRIATION

Plains Shelterbelt Project.-- The shelterbelt project was inaugurated in August, 1934. Work on the project was started immediately, and a field organization was established to decentralize the work, taking full advantage of all Federal, State, and other local agencies.

Land for shelterbelt plantings has been obtained under lease or under agreements with farmers to use A.A.A. crop-reduction lands. In both cases agreements carry an option to purchase at a stipulated price per acre. In some cases land for shelterbelts or for homestead planting has been granted by the farmer for short periods.

Areas for which shelterbelt agreements had been entered into were plowed, fenced, and cultivated so that the soil would absorb all the precipitation and that the soil moisture would be conserved. With the aid of the Biological Survey, a rodent-control campaign was launched to reduce as far as possible the number of destructive rodents.

Arrangements were made with local nurserymen to produce plant stock. Nurseries were leased and stock purchased wherever suitable material was available. At present 21 nurseries are being operated to produce stock of some 50 species needed annually for shelterbelt planting. This planting stock is being grown from seed 95 percent of which is collected locally because adapted to soil and climatic conditions of the region. Nearly 60 tons of seed were collected in the spring of 1935.

Planting has been done with labor obtained in so far as available from local relief rolls. Farmers and their work stock and machinery have been employed wherever possible.

Investigations.-- The investigations under way under this appropriation deal with the influence of forest and related cover upon streamflow, floods, erosion, and water conservation. They are basic to watershed management practices on forest and range lands for which the Forest Service is responsible through the national-forest system and in the cooperative development of State and private forestry. They are integrated with other phases of forest research and responsibility for them is assigned to the Forest Service by the Secretary of Agriculture. The Forest Service has conducted this type of research since 1910 and in recent years has made heavy investments in field stations, installations, and trained personnel.

These studies are a part of the national program of watershed research applying to forest and range lands submitted to the Agricultural Subcommittee of the Senate Committee on Appropriations during the hearings for the appropriation bill for 1932. Their purpose is to determine whether forest and range cover may serve as the major factor in providing satisfactory conditions of water flow on entire watersheds or important parts of watersheds; and, if so, whether it must be used in a virgin condition or may be modified by cutting or grazing. They seek to ascertain how to conserve soil fertility and moisture for the growing of forest and range forage and how to deliver the maximum amounts of useable water for irrigation, municipal use, power, navigation, etc. They aim to make waste lands productive, to protect against destructive floods, and to

safeguard public and private works--investments which already aggregate hundreds of millions of dollars. They are designed to furnish facts and remedial measures applying to forest and range lands as a basis for action by Federal, State, and other agencies.

Practically every watershed in the United States contains some portion of the 615 million acres of forest land or of the 550 million acres of non-forest range land, or both, and the behavior of the stream is directly influenced by conditions on this land. The disastrous Mississippi flood and many other floods of recent years, the rapidly increasing demand for irrigation water throughout the West, and the shortage of municipal water for many cities and towns during drought years greatly accentuate the problem caused by increasing population and have focused attention on both forest and range as related to water supply, to streamflow regulation, and to erosion control.

The investigations are conducted under the following projects:

(a) Forest cover investigations.--- This work deals with the effect of forest cover on precipitation, runoff, stream behavior, and floods; in short, with the entire water cycle. The enormous losses involved in soil deterioration alone and the ultimate effect of these losses upon national economy are so far-reaching as to be self-evident. The reduction of such losses on nonarable lands through proper utilization of natural cover offers an extremely promising field. Where conditions on forest lands due to fires, destructive logging, smelter fumes, and other causes have reached an acute stage, remedial measures suitable to local conditions must be worked out. These involve the solution of a number of complex problems, including the development of forest species suitable to introduction on a wide variety of unfavorable sites, the development of control measures to prevent soil deterioration and to increase water absorption, and the development of water-conservation practices to provide and maintain adequate supplies of usable water. Work is now carried on by the Appalachian, California, Southern, and Lake States regional forest experiment stations.

(b) Brush and herbaceous cover investigations.--- This work includes studies to determine the relation of brush and herbaceous cover to erosion and streamflow, the effects of grazing, and how overgrazed areas can be reclaimed and their watershed values restored. Depletion of the natural vegetative cover through overgrazing on nonforest range lands has contributed greatly to the irregularity of streamflow, to the silting of streams, reservoirs, and irrigation works, and to the scarcity of water for domestic and irrigation uses. Results have been of great value to Federal and State agencies in emergency programs of watershed management, but the urgent demand for additional information requires continuation of these studies, which are conducted by the Intermountain, Rocky Mountain, and Southwestern forest and range experiment stations.

(k) FOREST FIRE COOPERATION

Appropriation Act, 1936	\$1,578,632
Budget Estimate, 1937.	<u>1,731,382</u>
Increase.	<u>152,750</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase -
<u>Obligated:</u>				
Taxation and insurance investigations	\$44,736	\$45,000	\$45,000	---
Payments to States and Territories for forest fire prevention and suppression ...	1,521,869	1,533,632	1,686,382	+\$152,750(1)
Total obligations	1,566,605	1,578,632	1,731,382	+ 152,750
<u>Unobligated:</u>				
Savings	7,014	---	---	---
Total	1,573,619	1,578,632	1,731,382	+152,750(1)

(1) The increase of \$152,750 is for "Payments to States and Territories for forest fire prevention and suppression". The increase will permit the extension of systematic protection to a part of the 189 million acres of forest land now unprotected and will strengthen the present inadequate protection of the 237 million acres now under some degree of organized protection.

If this increase were devoted to the extension of protection to areas not now protected, it would cover about 26 million acres under standard co-operative arrangements. It would actually be used, however, not only for extending protection to new territory but for increasing protection on areas not now adequately provided for. Additional State and private funds will be made available as a direct result of the increase. It is expected that Federal cooperation will be initiated in two States, where the work is not now being carried on, before the end of the fiscal year 1937. In the fiscal year 1935 State and private funds budgeted in these cooperative projects amounted to a total of \$4,508,248. The corresponding figure for the fiscal year 1936 is \$4,800,024. Of this total, \$1,105,568 represents the amount budgeted by private owners.

The question is sometimes asked, "Why does the public aid in the protection of private forest land from fire?" The following reasons, it is believed, fully justify and demonstrate the necessity for such public activities:

(1) A part of the benefit of protection comes to the public and not to the private owners as such. (2) A large part of the fires which occur and must be fought is caused by the public and not by the owner. (3) The public alone is able to cope with the situation, and public participation in the projects is essential to success.

Federal participation is of particular importance because the maintenance and restoration of region-wide watersheds are involved which under adequate protection are capable of greatly increasing the wealth of the Nation in timber and water resources, game and fish, recreation, and soil conservation. Furthermore, forest fire is no respecter of State boundaries, and correlation of the various State agencies is essential. This correlation is greatly facilitated by Federal cooperation. From the standpoint of national welfare and the maintenance of those domestic industries which are dependent upon American forests, those areas which are privately owned are of greater importance than publicly owned land, being much larger in extent and in timber-producing capacity. By the wise exercise of leadership, the Federal Government contributes largely toward improved standards and substantial State and private participation. Section 2 of the Clarke-McNary Law (Act of June 7, 1924) constitutes clear-cut recognition of this national interest and responsibility.

Results accomplished justify increased participation by the Federal Government. In the calendar year 1934, 237 million acres of State and private forest land were protected from fire by these cooperative projects. The total area estimated as in need of such protection is 427 million acres.

WORK UNDER THIS APPROPRIATION

Forest Taxation and Insurance.-- Taxation under present methods is generally recognized as one of the greatest obstacles to private forestry practice and a major cause of forest destruction. Interest in forest taxation is widespread on the part of forest owners, State and local authorities, and the agencies concerned with the conservation and development of forest resources. Urgent demand exists for aggressive Federal assistance in connection with forest tax reform, to accomplish the stated objectives of forest conservation and the rehabilitation of the forest products industries under recovery measures of the Administration. This demand has been stimulated by the critical tax situation in many forest regions and by the President's offer of Federal cooperation in a letter to the Governors stressing reform in taxation as one vital measure in advancing forestry. Another important phase of this work consists of a study of local public finances as affected by existing and proposed national forests and of the problem of improving the existing plan by which the Federal Government contributes 25 percent of the gross receipts from national forests to the States for the support of local schools and roads. This project involves studies, in cooperation with State and other agencies, necessary to supplement, adapt, and effect the general conclusions and principles already determined in the field of forest taxation and insurance to the widely varying conditions of individual States. This phase of the project is still in a very early stage.

This project also includes the investigations of principles of, and the feasibility of developing, a system of forest-fire insurance. Special emphasis

is being given to the prosecution of this study because the information being obtained as to damage and risk elements is essential to the development of a sound system of forest credits, itself an important aid to the conversion of private forest enterprises from a destructive liquidation to a sustained production basis. A comprehensive report analyzing the findings and possibilities and presenting constructive suggestions for setting up forest fire insurance in the Pacific Coast States is ready for publication.

Cooperation with States in forest fire prevention and suppression.--- The Forest Service participates in this work under agreements with the several States which provide for plans of work, budgets, Federal reimbursement to the States after the work is done and paid for, and for inspection. The Federal participation in this cooperative forest-protection work is a Federal job of long standing, the basis for cooperative projects in 38 States and one territory, embracing the Federal Government's part in protection from fire of 427 million acres. There are still 189 million acres with no protection provided. Thirty-eight States and Hawaii are now in cooperation. The effect of this protection is striking. Only 1.12 percent of the productive forest area which was under protection was reported as burned over in that year, as compared with 19 percent of the area which was unprotected. The total damage from fire on the protected area was estimated at \$8,100,350, as contrasted with an estimate of over \$37,000,000 damage on unprotected land.

The following table shows, by States, the Federal allotments compared with contributions made by States and private agencies for forest-fire cooperative work conducted under the provisions of the Clarke-McNary Act.

STATE ALLOTMENT DATA

FOREST FIRE COOPERATION UNDER SECTION 2 OF THE CLARKE-McNARY LAW

State	Estimated cost of adequately protecting State and pri- vate forest land	State and Private funds budgeted, fiscal year 1936	Federal allotments	
			Fiscal year 1936	Estimates for 1937 (actual allotments will depend upon State expenditures)
Maine	\$342,000	\$226,695	\$48,600	\$56,674
N. H.	131,000	64,794	15,300	17,500
Vermont	57,000	18,750	5,700	6,275
Mass.	169,000	82,527	22,800	25,595
R. I.	17,000	20,078	2,300	3,058
Conn.	76,000	64,980	14,300	16,686
New York ...	378,000	300,190	55,500	66,435
New Jersey..	128,000	117,490	24,300	28,644
Pennsylvania	364,000	300,660	49,900	60,899
Delaware....	12,000	6,800	1,500	1,737
Maryland ...	73,000	38,218	10,600	11,912
Virginia ...	397,000	42,090	31,760	32,178
W. Virginia.	312,000	140,570	27,100	31,783
Kentucky....	212,000	17,400	9,500	9,820
N. Carolina.	632,000	118,720	50,560	53,321
S. Carolina.	378,000	82,401	30,240	32,353
Georgia.....	775,000	184,229	62,000	66,951
Florida.....	847,000	126,159	67,760	70,126
Alabama.....	573,000	48,590	45,840	45,951
Mississippi..	563,000	48,425	45,040	45,177
Louisiana....	434,000	101,262	41,600	44,296
Texas.....	434,000	98,806	40,400	42,996
Oklahoma....	165,000	12,725	12,725	12,725
Arkansas....	484,000	61,371	38,720	39,638
Tennessee...	245,000	71,656	19,600	21,709
Michigan....	662,000	324,786	92,400	103,411
Wisconsin...	390,000	287,928	67,800	78,200
Minnesota...	697,000	242,852	84,700	92,278
Ohio.....	60,000	23,317	5,600	6,350
Indiana	84,000	20,029	6,900	7,439
Illinois....	77,000	-	-	-
Missouri....	347,000	-	-	-
Montana.....	190,000	77,105	22,200	24,708
Idaho (N)...	420,000	137,187	48,100	52,296
Idaho (S)...	27,000	25,148	5,200	6,131
S. Dakota...	4,500	4,724	700	877
N. Mexico...	26,000	6,608	2,100	2,283
California..	969,000	513,485	138,400	156,059
Nevada.....	13,600	5,303	2,200	2,371
Hawaii.....	5,173	5,216	600	794
Washington..	632,000	455,200	87,200	103,590
Oregon.....	584,000	275,550	91,800	101,069
Total.....	13,386,273	4,800,024	1,429,545	1,582,295
Administration and contingent expenses.....			104,087	104,087
Forest Taxation and Insurance Project.....			45,000	45,000
Total			1,578,632	1,731,382

(1) COOPERATIVE DISTRIBUTION OF FOREST PLANTING STOCK

Appropriation Act, 1936	\$56,379
Budget Estimate, 1937	<u>70,579</u>
Increase	<u>14,200</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase
<u>Obligated:</u>				
Payments to States for cooperative distribution of forest planting stock	\$55,613	\$56,379	\$70,579	\$14,200 (1)
<u>Unobligated:</u>				
Savings	683	- -	- -	- -
Total	56,296	56,379	70,579	14,200 (1)

(1) The increase of \$14,200 will be used to cooperate with the States in the production of forest trees for farm planting. It will permit the establishment of two new State projects and continuing the work now operating in 40 States and 2 Territories, on a basis of \$1,600 per State. The limits of the present appropriation have made it necessary this year to decrease the maximum per State to \$1,400, and the small size of the fund is proving a serious handicap to the undertaking. The advantage of establishing plantations, both upon farm land which is proved to be submarginal for the production of agricultural crops during average year and also upon such other farm land as is not otherwise profitably used, is well recognized and is believed to be ample justification for the increased appropriation requested.

WORK DONE UNDER THIS APPROPRIATION

The work under this appropriation consists of cooperation with States in the procurement, production, and distribution of forest-tree seeds and plants for establishing farm woodlots upon non-forested lands, as authorized by Section 4 of the Clarke-McNary Act of June 7, 1924. The work is administered directly by the State agencies; the Forest Service inspects, advises, and correlates. It has contributed substantially to the C.C.C. program through the facilities which have been available for the use of the C.C.C. camps in producing trees for erosion and other C.C.C. planting. The output of these projects in trees is between 20 and 25 million per year, the number of cooperating States being 40, in addition to Puerto Rico and Hawaii. An effective program of farm land

utilization is dependent upon the availability of forest planting stock. It is very desirable that these projects be built up at this time, when opportunities are presented at every hand for the profitable utilization of otherwise waste farm lands for the production of trees both from the point of view of the individual farmer and the general public, and when the desirability is so keenly felt of planting for the control of erosion by wind and water and for the amelioration of droughts. The present annual supply of trees should be substantially increased if we are to take advantage of opportunities offered by the present movement in land-use planning.

(m) NATIONAL FOREST RESERVATION COMMISSION

Appropriation Act, 1936	\$7,500
Budget Estimate, 1937	- -
Decrease	7,500 (a)

(a) Apparent decrease only; funds for 1937 are being transferred to item "General Administrative Expenses."

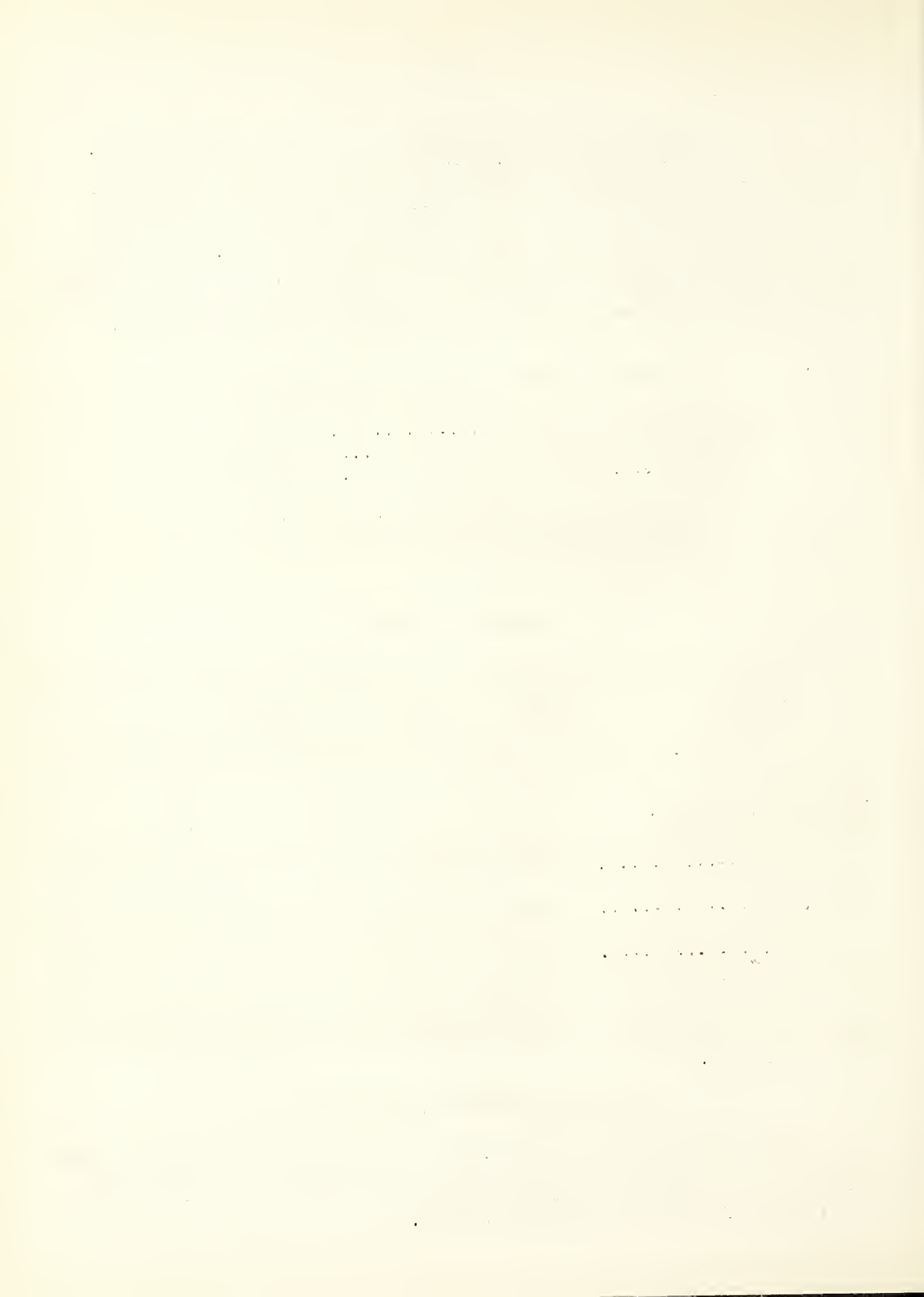
PROJECT STATEMENT

Project	1935	1936 (Estimated)	1937 (Estimated)	Decrease
<u>Obligated:</u>				
Expenses of National Forest Reservation Commission	\$4,867	\$7,500	- -	-\$7,500 (1)
<u>Unobligated</u>	1,533	- -	- -	- -
Total	6,400	7,500	- -	- 7,500 (1)

(1) The expenses of the National Forest Reservation Commission will be paid from the appropriation "General Administrative Expenses" in the fiscal year 1937.

WORK DONE UNDER THIS APPROPRIATION

This appropriation has been used for the expenses of the National Forest Reservation Commission and its members and employees, who, under the Weeks law, as amended by the Clarke-McNary Law, are authorized to approve the purchase of lands for forestry purposes.



(n) ACQUISITION OF LANDS IN UINTA AND WASATCH NATIONAL FORESTS, UTAH

Appropriation Act, 1936	- -
Budget Estimate, 1937	\$50,000
Increase	<u>50,000</u>

PROJECT STATEMENT

Project	1935	1936 (Estimated)	1937 (Estimated)	Increase
Acquisition of land	- -	- -	\$50,000	+\$50,000 (1)

(1) This is a new appropriation, based upon the Act of August 26, 1935, which authorizes the purchase of private lands within the boundaries of the Uinta and Wasatch National Forests, Utah, for the purpose of placing such lands under a form of management which will minimize soil erosion and and flood damage. The purchase price of the land is to be paid for out of receipts from the two forests mentioned above.

The land to be purchased is located on the western slope of the Wasatch Range in Utah. The greater part of the virgin timber resources of these lands was used to develop the tributary valley. Subsequent fires destroyed or impaired much of the forest cover and, because of their availability as spring and fall ranges, the lands were very heavily stocked with range and domestic livestock. Due to these three causes, the vegetative cover which once protected the steep slope and held the soil in place very largely has been destroyed. In consequence of these conditions soil erosion has been greatly accelerated, and heavy rainfall frequently results in torrential floods which carry away enormous volumes of soil and debris and cause heavy destruction to property in the adjoining valleys.

Detailed studies made in 1930 by a special commission appointed by the Governor of Utah determined beyond dispute that these destructive floods and landslides originated exclusively in the denuded portions of the slopes - never in the parts which still support stands of timber. Inasmuch as these lands adjoin lands owned by the Federal Government and administered by the Forest Service, the cost of administering and protecting the purchased lands will not be great.

WORK DONE UNDER THIS APPROPRIATION

This appropriation will be used only for the purchase of land. When purchased, the lands will be administered as parts of the Uinta and Wasatch National Forests.

(o) PAYMENTS TO STATES AND TERRITORIES, NATIONAL FOREST FUND

Appropriation, 1936	\$660,000
Budget Estimate, 1937	<u>875,000</u>
Increase	<u>215,000</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase
Payments to States and Territories from national forest receipts	\$821,399	\$817,635	\$875,000	+\$57,365
Difference between estimate and actual obligations	-161,399	-157,635	- -	+\$157,635
Total	660,000	660,000	875,000	+\$215,000 (1)

(1) An additional \$215,000 is estimated because of anticipated increase in receipts during the fiscal year 1936.

WORK DONE UNDER THIS APPROPRIATION

The law requires that 25 percent of all money received from the national forests during any fiscal year be paid to the States and Territories in which the forests are located. The amount due States for the fiscal year 1935, which must be paid during the fiscal year 1936, is \$817,635.

The amount of this appropriation varies each year in direct proportion to national-forest receipts during the previous fiscal year. Increases in this appropriation are offset by additional revenue to the Federal Treasury in the ratio of 4 to 1; that is, for each dollar increase in the payment to States the gross revenue to the Federal Treasury has been increased four dollars.

(p) PAYMENTS TO SCHOOL FUNDS, ARIZONA AND NEW MEXICO,
NATIONAL FOREST FUND

Appropriation, 1936 \$28,500
Budget Estimate, 1937 28,500

PROJECT STATEMENT

Project	1935	1936 (Estimated)	1937 (Estimated)	Increase or decrease
Payments to school funds, Arizona and New Mexico	\$23,242	\$20,773	\$28,500	+ \$7,727
Difference between estimated and actual obligations	+ 5,258	+ 7,727	- -	- 7,727
Total	28,500	28,500	28,500	- -

WORK DONE UNDER THIS APPROPRIATION

At the close of the year there is paid to the States of Arizona and New Mexico such proportion of the gross proceeds of all the national forests within those States as the area of land granted to the States for school purposes within the national forests bears to the total area of all national forests within the States. The amount due Arizona and New Mexico for the fiscal year 1935, which must be paid during the fiscal year 1936, is \$20,773. These payments are required by the Act of June 20, 1910 (36 Stat. 562 and 573) which provides "That the grants of Sections two, sixteen, thirty-two and thirty-six to said State, within national forests now existing or proclaimed, shall not vest the title to said section in said State but said granted sections shall be administered as a part of said forests, and at the close of each fiscal year there shall be paid to the Secretary of State, as income for its common-school fund, such proportion of the gross proceeds of all the national forests within said State as the area of lands hereby granted to said State for school purposes which are situated within said forest reserves may bear to the total area of all the national forests within said State the amount necessary for such payments being appropriated and made available annually from any money in the Treasury not otherwise appropriated".

(q) ROADS AND TRAILS FOR STATES, NATIONAL FOREST FUND

Appropriation Act, 1936	\$328,000
Budget Estimate, 1937	<u>350,000</u>
Increase	22,000

PROJECT STATEMENT

Project	1935	1936 :(Estimated):	1937 :(Estimated):	Increase
Roads and trails for States, national forest fund	\$326,476	\$350,000	\$350,000	- -
Expended from prior year appropriations	- 326,476	- 22,000	- -	+\$22,000
Total	- -	328,000	350,000	+ 22,000 (1)

(1) An additional \$22,000 is estimated in this fund because of anticipated increase in receipts during the fiscal year 1936.

WORK DONE UNDER THIS APPROPRIATION

An additional 10 per centum of all moneys received from the national forests during each fiscal year is available at the end thereof to be expended by the Secretary of Agriculture for the construction and maintenance of roads and trails within the national forests in the States from which such proceeds are derived. (U.S.C., title 16, sec. 501).

(r) COOPERATIVE WORK, FOREST SERVICE
(Trust funds)

Appropriation Act, 1936 \$2,000,000
Budget Estimate, 1937 2,000,000

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Construction of improvements	\$176,315	\$1,452,000	\$1,452,000
Maintenance of improvements	55,048	60,000	60,000
Prevention and suppression forest fires	353,803	400,000	400,000
Brush and other debris disposal from timber-sale operations	55,904	60,000	60,000
Forest investigations for other agencies	10,023	11,000	11,000
Administration of privately owned lands	10,257	11,000	11,000
Reforestation	173	1,000	1,000
Refunds to cooperators	13,221	5,000	5,000
Total obligations	674,744	2,000,000	2,000,000
<u>Unobligated:</u>			
Difference between estimated and actual obligations	1,325,256	- -	- -
Total	2,000,000	2,000,000	2,000,000

WORK DONE UNDER THIS APPROPRIATION

Contributions are made to the Forest Service by individuals, communities, and associations for improvement work, fire control, forest investigations, slash disposal of timber-sale areas, and administration of privately owned land within national-forest boundaries and are deposited to this fund. Expenditures are controlled by the Forest Service.

PASSENGER-CARRYING VEHICLES

The authorization for purchase of passenger-carrying vehicles contemplates an increase of \$31,768 (\$49,310 in 1936; \$81,078 estimated for 1937) for this purpose. As shown by the Budget schedule, the \$81,078 would permit needed replacement of 69 vehicles at a net average cost of \$512 each, when exchange allowances are taken into account and the purchase of 66 additional vehicles at an average cost of \$662 each.

Approximately 65 percent of the employees of the Forest Service do the major part of their work while actually in the woods and must necessarily be in a travel status a great part of their time. Where there are few roads in the forests work must be performed largely by the use of privately owned or Government-maintained horses and employee-owned or hired cars paid for on a mileage basis. It is not economical for the Government to own cars where their use is limited and the annual mileage consequently low, but where roads and the work to be performed call for the greater part of travel by car it is more economical for the Government to own the car than pay mileage. Mileage rates are based on actual operating costs of private owners and, since the Government can purchase cars, repair parts, gasoline, and oil at large discounts and pays no taxes or insurance, it can operate cars for much less per mile than the employee. As a substitute for horses in administration and fire control the car is indispensable. With the development of roads in the forests the fire hazard and use of such areas have increased, and the automobile has been largely instrumental in keeping abreast of such managerial problems. The policy has been the gradual substitution of a more efficient means of transportation for a less efficient one, with little or no increase in the aggregate cost. It is recommended that this practice be continued as rapidly as funds will permit.

The purchase of additional cars included in these estimates will reduce the use of personally owned cars, which cost on the average 5 cents per mile for travel and 10 to 15 cents per mile for hauling in fire and other emergencies. They are needed to supply a few more field administrative officers with Government-owned cars, since now only a small percentage of the field officers are so supplied.

The 69 cars to be exchanged are cars or trucks which during the fiscal year 1937 will have been used for the maximum number of miles of economical operation.

EMERGENCY FUNDS

(1) Direct Allotments

Projects	Obligated, 1935	Estimated obligations, 1936
1. <u>Agricultural Adjustment Administration (Advances to A.A.A.):</u> For inspection work in connection with agricultural adjustment programs	\$ 250	- - -
2. <u>Public Works Allotments (National Industrial Recovery Act):</u>		
Permanent fire breaks	690,124	\$26,408
Lookout houses, towers, and observatories.....	209,782	7,821
Telephone lines for fire protection.....	339,824	13,282
Range fences, driveways, and bridges; water development for stock.....	802,016	30,829
Public campground improvement	272,192	11,804
Dwellings, barns, and offices at isolated stations.....	428,982	16,989
Miscellaneous construction, including fences and water developments for administrative and research uses, landing fields, small buildings	349,621	14,026
Eradication of poisonous plants from national-forest ranges.....	83,402	3,291
White-pine blister rust control.....	495,283	19,486
Control of tree-destroying insects	115,206	4,744
Timber stand improvement	1,045,899	33,825
Planting and tree nurseries.....	132,891	5,821
Construction of buildings requiring legislation:	299,118	11,793
Estimating timber resources.....	74,823	3,068
Revegetation of forest ranges.....	38,106	1,492
Rodent control	1,406	-
Erosion control	166,342	6,729
Improvement of forest waters for fish protection	79,341	3,292
Range surveys	33,802	1,528
Boundary surveys	19,023	873
Surveys needed for forest activities, not including topographic quadrangles or General Land Office cadastral surveys.....	164,186	6,297
Research:		
Forest management	38,281	1,723
Range investigation	18,116	922
Forest economics	1,921	-
Forest survey	72,008	2,887
Soil erosion	7,892	-
Sub-total	5,979,587	228,930

Projects	Obligated, 1935	Estimated obligations, 1936
Add amount to be used in lieu of regular appropriations for:		
General administrative expenses.....	\$ 9,445	\$ 341
National-forest administration.....	439,399	1,785
Aerial fire control	8,905	3,582
Classification of lands	475	697
Sanitation and fire prevention	13,833	5,919
Planting on national forests	116,486	36,312
Reconnaissance	25,554	8,903
Improvements on national forests	114,108	28,071
Forest survey	105,628	12,915
Soil-erosion investigations	63,020	4,622
Total, Public Works Allotment (N.I.R.)....	6,876,440	: 332,077

Distribution of Foregoing Allotments by States

Alabama.....	\$9,752	- - -
Alaska	9,987	\$2,400
Arizona.....	247,047	2,365
Arkansas	128,552	10,670
California	1,145,960	24,333
Colorado	91,184	307
Connecticut.....	1,490	- - -
District of Columbia	164,362	8,250
Florida	26,580	251
Georgia.....	34,169	237
Idaho	1,173,848	60,532
Illinois	20,030	34
Indiana	1,053	- - -
Kentucky	17,492	755
Louisiana.....	56,055	4,529
Maine	1,058	- - -
Michigan	151,836	5,275
Minnesota	159,274	2,795
Mississippi.....	99,358	549
Missouri.....	12,767	- - -
Montana.....	477,587	22,202
Nebraska	21,717	1,105
Nevada	21,269	1,180
New Hampshire	35,696	165
New Jersey.....	5,947	- - -
New Mexico	183,703	2,600
New York.....	7,911	- - -
North Carolina	44,334	19,138
North Dakota.....	426	- - -
Ohio	1,084	- - -
Oklahoma	10,411	849
Oregon.....	258,463	- - -
Pennsylvania.....	36,803	1,750

Projects	Obligated, 1935	Estimated obligations, 1936
South Carolina	\$25,129	\$2,094
South Dakota	18,889	- - -
Tennessee	57,941	345
Texas	15,212	6,048
Utah	137,694	1,638
Vermont	9,591	501
Virginia	36,480	4,251
Washington	320,859	17,441
West Virginia	64,421	7,700
Wisconsin	523,498	15,257
Wyoming	112,668	1,384
Lieu of regular funds	896,853	103,147
Total	6,876,440	332,077
3. <u>Loans and Relief in Stricken Agricultural Areas:</u> For preliminary work relating to the establishment of a shelterbelt area in the Great Plains region.....	(a) 848,979	- - -

Under this allotment studies were made of the climate, soils, native vegetation, water resources, and past planting experiences of farmers and others in the region. After this survey had been completed, about 125 miles (or 2,000 acres) of field shelterbelts were planted in strips approximately 8 rods wide; 5,100 acres of windbreaks were also planted. In addition, nurseries have been developed for the growing of seedlings to be used in the project. The funds were allocated to the following States:

<u>State</u>	<u>Allotment</u>
Colorado	\$4,194
Kansas	117,050
Minnesota	20,674
Nebraska	314,950
North Dakota	175,560
Oklahoma	66,810
South Dakota	117,556
Texas	20,671
Washington office	11,514
Total	848,979

(a) Exclusive of amounts transferred to and obligated by other bureaus, as follows: Weather Bureau, \$1,481; Bureau of Plant Industry, \$10,952; Bureau of Chemistry and Soils, \$12,903; Bureau of Entomology and Plant Quarantine, \$8,274; and Bureau of Biological Survey, \$25,500.

Projects	Obligated 1935	Estimated Obligations, 1936
4. <u>Emergency Relief Appropriation Act of 1935:</u>		
(a) Administrative expenses in connection with miscellaneous forestry projects....	- - -	\$1,172,500
(b) Miscellaneous forestry activities, including:		
National-forest improvements, etc.	- - -	8,614,392
Acquisition of additional forest lands	- - -	2,532,150
Plains shelterbelt project	- - -	1,790,958
Forest research	- - -	890,000
Total, miscellaneous projects (item b)	- - -	13,827,500
(c) Administrative expenses incident to acquisition of forest lands	409,584	90,416
(d) Acquisition of additional forest lands...	- - -	12,000,000
Total, Emergency Relief	409,584	27,090,416

(b) The foregoing \$13,827,500 for miscellaneous forestry projects has been allocated to States as follows:

<u>State</u>	<u>Allotment</u>
Alabama	\$250,820
Alaska	57,570
Arizona	326,330
Arkansas	486,280
California	1,353,201
Colorado	479,900
Connecticut	6,720
District of Columbia . . .	26,900
Florida	23,457
Georgia	320,820
Idaho	1,415,302
Illinois	140,976
Indiana	91,955
Iowa	82,314
Kansas	355,015
Kentucky	209,502
Louisiana	61,391
Maine	4,932
Maryland	2,518
Massachusetts	2,880
Michigan	530,695
Minnesota	349,820
Mississippi	92,105

<u>State</u>	<u>Allotment</u>
Missouri	\$385,355
Montana	777,432
Nebraska	360,890
Nevada	71,985
New Hampshire	166,724
New Jersey	960
New Mexico	326,329
New York	4,799
North Carolina	450,069
North Dakota	396,979
Ohio	172,806
Oklahoma	205,621
Oregon	678,573
Pennsylvania	169,057
Puerto Rico	7,532
South Carolina	123,205
South Dakota	378,515
Tennessee	208,744
Texas	264,773
Utah	316,731
Vermont	31,634
Virginia	278,796
Washington	626,744
West Virginia	138,192
Wisconsin	400,487
Wyoming	163,165
Total	13,827,500

(d) The \$12,000,000 for acquisition of additional forest lands is being used in conformity with the provisions of the Act of March 1, 1911 (36 Stat., 91), as amended, and has been allocated to States as follows:

<u>State</u>	<u>Allotment</u>
Alabama	\$373,113
Arkansas	341,788
California	470,761
Florida	70,268
Georgia	359,861
Illinois	163,333
Indiana	292,667
Kentucky	203,495
Louisiana	367,241
Maine	59,532
Michigan	1,133,080
Minnesota	804,607
Mississippi	934,289
Missouri	505,322
New Hampshire	31,934
North Carolina	1,086,617
North Dakota	4,796

<u>State</u>	<u>Allotment</u>
Ohio	\$234,842
Oklahoma	4,707
Pennsylvania	9,626
Puerto Rico	4,455
South Carolina	406,841
Tennessee	24,659
Texas	81,107
Vermont	95,643
Virginia	844,624
West Virginia	429,102
Wisconsin	226,074
Unallotted	<u>2,435,616</u>
Total	12,000,000

WORK DONE UNDER DIRECT EMERGENCY ALLOTMENTS

These allotments are used for such projects as the construction and maintenance of firebreaks, forest-fire lookout houses, towers and observatories, landing fields, telephone lines, forest roads and trails, housing for forest officers, miscellaneous buildings and structures, shelterbelt planting, planting the tree nurseries, thinning of forest stands, fire prevention and control, fire-hazard reduction, construction and maintenance of improvements for recreational use of the forests, control of tree-destroying insects and diseases and of range-destroying rodents, eradication of poisonous range plants and revegetation of depleted ranges, construction and maintenance of range fences and other range improvements; surveys of forest resources such as timber, forage, water, wildlife, and related activities; surveys needed for forest activities, power-resource evaluation and appraisal, development of the fish and game resources; studies relating to forest, range, and watershed management, protection, development, and utilization; acquisition of lands; and for other work and purchase of equipment and supplies incident to or necessary in connection with any projects of the character numerated above.

(2) Projects financed through other Government agencies.

Emergency Conservation Work (authorized by Act of March 31, 1933 and Act of April 8, 1935; allotment through War Department):

	<u>1935</u>	<u>1936</u> (estimated)
1. <u>Emergency Conservation Work</u> <u>on National Forests</u>	\$35,475,066	<u>\$31,261,443</u>

Estimated obligations by States are given below:

	<u>1935</u>	<u>1936</u> (estimated)
Alabama	\$253,166	\$370,079
Arizona	1,396,837	958,791
Arkansas	1,414,934	663,299
California	6,090,903	3,712,978

	1935	1936 (estimated)
Colorado	\$ 767,040	\$507,209
Connecticut.	15,429	- - -
Florida	542,840	354,287
Georgia	496,935	395,262
Idaho	3,852,764	2,840,516
Illinois	548,351	491,553
Indiana	120,839	186,645
Iowa	102,472	51,983
Kansas	250	- - -
Kentucky	355,299	298,676
Louisiana	434,212	325,147
Maine	281	- - -
Maryland	- - -	28,750
Massachusetts	853	- - -
Michigan	1,499,498	2,055,650
Minnesota	1,350,363	1,573,271
Mississippi	986,838	703,895
Missouri	818,617	741,267
Montana	912,173	1,148,271
Nebraska	63,418	52,614
Nevada	119,513	248,116
New Hampshire.	623,223	517,248
New Jersey	630	- - -
New Mexico	749,011	812,055
New York	1,154	- - -
North Carolina	1,358,591	840,431
North Dakota	4,647	3,148
Ohio	135,922	381,895
Oklahoma	255,270	104,391
Oregon	1,357,666	1,664,156
Pennsylvania	413,872	461,873
South Carolina	283,015	296,590
South Dakota	412,599	681,088
Tennessee	1,834,852	1,005,476
Texas	345,269	437,444
Utah	740,554	971,979
Vermont	97,389	132,519
Virginia	769,132	581,483
Washington	1,220,138	1,431,997
West Virginia.	390,015	438,381
Wisconsin	1,448,032	1,754,518
Wyoming	314,463	958,701
District of Columbia	75,797	77,811
Total Emergency Conserva- tion Work on National Forests	35,475,066	31,261,443

WORK DONE UNDER THIS ALLOTMENT

This allotment is used for the pay of supervisory and facilitating personnel necessary for the field work done from E.C.W. camps on national forests; also for purchase of necessary equipment and construction materials and for miscellaneous expenses incident to the field work of the camps. The field work on the national forests includes construction of physical improvements needed for the protection and administration of the forests, tree planting, thinning of young stands of timber, destruction of undesirable timber species, rodent control, etc.

	<u>1935</u>	<u>1936</u>
2. <u>Emergency Conservation Work</u>		(estimated)
<u>in Alaska</u>	\$372,390	\$467,369
	<hr/>	<hr/>

WORK DONE UNDER THIS ALLOTMENT

This allotment (Alaska) is used for pay and allowances to dependents of enrolled members of the Civilian Conservation Corps and for salaries and wages of extra supervisory and clerical personnel needed in connection with the work. It is also used for the purchase of clothing, subsistence, supplies, and camp equipment required for enrolled men of the corps and for the purchase of construction materials used in the work. Classes of work done under this allotment include construction of trails, minor roads, bridges, water development and improvement, and miscellaneous administrative improvements; roadside clearings and public campground improvement, estimating timber resources, and other miscellaneous work. The men engaged in the work are recruited from the unemployed local residents without regard to age.

	<u>1935</u>	<u>1936</u>
3. <u>Emergency Conservation Work on</u>		(Estimated)
<u>State, municipal, and privately</u>		
<u>owned land</u>	\$23,223,199	\$22,430,881
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Estimated obligations by States are given below:

	<u>1935</u>	<u>1936</u>
		(Estimated)
Alabama	\$260,103	\$158,186
Arkansas	431,494	311,894
California	1,309,514	699,779
Colorado	1,005	10,269
Connecticut	711,045	613,770
Delaware	106,670	212,047
Florida	459,616	386,433
Georgia	684,913	482,538
Idaho	450,238	395,220
Illinois	321,450	264,434
Indiana	679,403	889,210

	<u>1935</u>	<u>1936</u> (estimated)
Iowa	\$382,536	\$267,064
Kansas	471,422	82,116
Kentucky	599,725	453,476
Louisiana	633,088	749,205
Maine	492,311	326,279
Maryland	297,725	557,326
Massachusetts	872,272	1,042,229
Michigan	1,084,632	1,061,482
Minnesota	604,127	785,575
Mississippi	204,007	99,224
Missouri	225,893	353,436
Montana	55,863	47,407
Nebraska	105,800	- - -
Nevada	130,044	44,670
New Hampshire	270,154	206,674
New Jersey	481,625	788,056
New Mexico	42,414	- - -
New York	1,378,453	1,916,370
North Carolina	389,669	332,461
North Dakota	141,628	- - -
Ohio	762,302	824,663
Oklahoma	351,685	104,245
Oregon	298,212	522,408
Pennsylvania	2,763,740	2,719,715
Rhode Island	184,841	168,338
South Carolina	414,753	359,669
South Dakota	36,256	40,262
Tennessee	463,188	266,984
Texas	746,873	397,297
Utah	198,491	- - -
Vermont	502,463	442,941
Virginia	632,893	787,009
Washington	444,807	441,215
West Virginia	327,024	562,303
Wisconsin	802,769	883,758
District of Columbia	<u>14,063</u>	<u>373,244</u>
Total Emergency Conservation		
Work on State lands	<u>23,223,199</u>	<u>22,430,881</u>

WORK DONE UNDER THIS ALLOTMENT

This allotment is used for the payment of expenses incurred by States in the conduct of Emergency Conservation Work on State, municipal, and privately owned lands, including the purchase of supplies, material, and equipment used in the work, for payment of salaries and wages of supervisory personnel directing the work of the enrolled men, and for other necessary expenses incident to the work.

Work being accomplished under this allotment includes such important conservation efforts as the following: Protection of State and private forest land from fire by construction of fire breaks, lookout towers, communication systems, truck trails, tool sheds, guard houses, and the fighting of forest fires; protection of State and privately owned forests

from the epidemic spread of forest insects and tree diseases; forest cultural measures to improve the forest growth on State-owned land; and the construction of simple dams and the planting of trees, grass, etc., for the control of erosion and flash run-off at the headwaters of streams.

	<u>1935</u>	<u>1936</u> (estimated)
4. <u>Emergency Conservation Work</u> <u>on Oregon and California</u> <u>Railroad Grant Lands</u>	<u>\$262,245</u>	<u>\$19,322</u>

WORK DONE UNDER THIS ALLOTMENT

This allotment is used for the pay of supervisory and facilitating personnel necessary for the field work done from E.C.W. camps on revested Oregon and California railroad grant lands in Oregon; also for purchase of necessary equipment and construction materials and miscellaneous expenses incident to such field work. The field work is done to make possible more effective fire protection on these publicly owned timber lands.

	<u>1935</u>	<u>1936</u> (estimated)
5. <u>Emergency Conservation Work</u> <u>in Puerto Rico.</u>	<u>\$692,784</u>	<u>\$891,832</u>

WORK DONE UNDER THIS ALLOTMENT

This allotment (Puerto Rico) is used for the payment of authorized enrollees and the supervisory personnel engaged in the technical direction of the work projects on the Luquillo National Forest and the insular forests, and for the purchase of equipment and supplies incident to the work.

The work projects comprise the construction and maintenance of roads and trails, production of nursery stock, making new and thinning old forest plantations, forest thinnings to improve the timber stands within the national and insular forests, and development of a recreational area within the National Forest. With a population of 1,500,000 the unemployment situation on the Island has been acute and, since the enrollment of the 1,200 men has been on a pro rata basis from the 72 insular municipalities, the E.C.W. work has played its part in giving a measure of relief. Camps are not established as they are in the States, since a large proportion of the enrollees live at home and go to and from the work projects.

	<u>1935</u>	<u>1936</u> (estimated)
6. <u>Emergency Conservation Work</u> <u>on Navy Department reservations.</u>	<u>.\$106,637</u>	<u>\$19,227</u>

WORK DONE UNDER THIS ALLOTMENT

This allotment is used for the pay of supervisory and facilitating personnel necessary for field work done from E.C.W. camps located on Navy Department reservations, such as Bremerton, Hawthorne, and Indian Head; also for the purchase of the necessary equipment and construction materials and for miscellaneous expenses incident to the field work of the camps. The field work includes construction of fire breaks, reduction of fire hazards, fire presuppression, forest stand improvement, truck trails, fences, and landing fields.

	<u>1935</u>	<u>1936</u> (estimated)
7. <u>Emergency Conservation Work</u> <u>in drought-stricken agricultural</u> <u>areas</u>	\$4,201,240	- - -

This allotment for Emergency Conservation Work in drought areas was allocated to States approximately as follows:

	<u>1935</u>
Arizona	\$244,037
California	853,330
Colorado	124,707
Idaho	92,243
Illinois	350,214
Indiana	36,342
Iowa	149,046
Kansas	213,500
Minnesota	311,369
Missouri	119,049
Montana	246,107
Nebraska	158,900
Nevada	15,642
New Mexico	141,849
North Dakota	127,141
Oklahoma	7,628
Oregon	2,117
South Dakota	235,925
Texas	66,954
Utah	310,536
Wisconsin	334,806
Wyoming	<u>9,298</u>
Total Emergency Conservation Work in drought stricken Agricultural areas	<u>4,201,240</u>

WORK DONE UNDER THIS ALLOTMENT

This allotment was used to pay for the supervisory and facilitating personnel necessary for the field work done from the additional camps in the drought-stricken agricultural areas; also for the purchase of the necessary equipment and construction materials and for miscellaneous expenses incident to the field work of the camps. The field work consisted of the same general kind of work done by other camps on the national forests and on State and municipal lands in the States in which these drought-relief camps were located, and in some instances the drought-allotment personnel was enrolled in the regular national-forest on State-land camps.

EMERGENCY FUNDS - BUREAU TOTAL

Summary

Projects	Obligated, 1935	Estimated obligations, 1936
(1) <u>Direct Allotments:</u>		
Agricultural Adjustment Administration (Advances to A.A.A.): Assistance in adjustment programs	\$250	- - -
Public Works Allotments (National Industrial Recovery Act):		
Physical improvements, control of tree-destroying insects and diseases, forest research etc.	5,979,587	\$228,930
Amounts in lieu of regular appropriations . . .	896,853	103,147
Total, P.W.A.	6,876,440	332,077
Loans and Relief in Stricken Agricultural Areas (preliminary work in establishment of Plains shelterbelt)	(a)848,979	- - -
Emergency Relief Appropriation Act of 1935:		
Miscellaneous forestry activities and administrative expenses incident thereto	- - -	15,000,000
Acquisition of forest lands including administrative expenses	- - -	12,090,416
Total, Emergency Relief	- - -	27,090,416
Total, Direct Allotments	7,725,669	27,422,493
(2) <u>Indirect Allotments</u> (Emergency Conservation Work, financed by War Department): Activities of Civilian Conservation Corps:		
National forests	35,475,066	31,261,443
Alaska	372,390	467,369
State, municipal and privately owned lands . . .	23,223,199	22,430,881
Oregon and California Railroad grant lands . . .	262,245	19,322
Puerto Rico	692,784	891,832
Navy Department reservations	106,637	19,227
Drought-stricken agricultural areas	4,201,240	- - -
Total, Indirect Allotments (E.C.W.)	64,333,561	55,090,074
Total, All Emergency Funds	72,059,230	82,512,567

(a) Exclusive of \$59,110 transferred to and obligated by other bureaus.

BUREAU OF CHEMISTRY AND SOILS

(a) GENERAL ADMINISTRATION

Appropriation Act, 1936 \$90,241
 Budget Estimate, 1937 90,241

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
General administration and business service	\$ 87,547	\$90,241	\$90,241
<u>Unobligated:</u>			
Savings	1,941	- -	- -
Total	89,488	90,241	90,241

WORK DONE UNDER THIS APPROPRIATION

This appropriation provides for the salaries and expenses of the office of the Chief of Bureau and the business organization units such as accounting, personnel, editorial, supplies, etc. It is for the purpose of maintaining general administration and direction of the Bureau.

(b) AGRICULTURAL CHEMICAL INVESTIGATIONS

Appropriation Act, 1936 \$383,930
 Allotments from:
 "Fruits and Vegetable Crops and Diseases",
 Bureau of Plant Industry (fruit and
 vegetable utilization) + 36,338
 "Insecticide and Fungicide Investigations",
 Bureau of Entomology and Plant Quarantine
 (pharmacological effects of insecticides) + 20,000
 Allotments from this appropriation to:
 "Industrial Utilization of Farm Products and
 By-Products" (utilization of agricultural
 wastes) -76,486
 "Agricultural Fires and Explosive Dusts"
 (work on farm fires) -13,522
 Net total available, 1936 350,260
 Budget Estimate, 1937 360,260
 Increase 10,000

Note.--The foregoing allotments are carried forward by means of transfers in the estimates for 1937.

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase
<u>Obligated:</u>				
Cereals, fruits, and vegetables investigations	\$105,477	\$162,879	\$162,879	- -
Sugar, starches, and fats investigations	73,930	74,245	84,245	+ 10,000 (1)
Protein and vitamin investigations	26,704	27,080	27,080	- -
Fundamental investigations in biochemistry relating to agricultural products . . .	60,350	66,056	66,056	- -
Chemical weed eradication investigations	- -	20,000	20,000	- -
Total obligations	266,461	350,260	360,260	+ 10,000
<u>Unobligated:</u>				
Legislative impoundments	1,000	- -	- -	- -
Other amounts unobligated	2,487	- -	- -	- -
Total	269,948	350,260	360,260	+ 10,000 (1)

(1) An increase of \$10,000 is requested for investigations directed toward the production of cane sirup of uniform grade and other aspects of the domestic sugar industry so as to improve marketability and increase the farm price. About 60 percent of the output of the continental cane-sugar industry consists of raw sugar. It is estimated that by manufacture of direct consumption sugar (that is, any sugar which is consumed as made from the cane without further refining), instead of raw sugar, the return from sugarcane to the planter may be materially increased. The purpose of this work is to solve chemical and technological problems in order that the continental cane-sugar industry may produce all its output in the form of direct consumption sugar and that cane growers may produce cane sirup of more marketable quality. This project concerns primarily the smaller sugar cane growers and smaller plantation sugar houses which are not equipped to produce sugar of refined granulated grade. The requirements of a considerable proportion of the retail trade and of food industries within reasonable transportation cost distance of points of production are such as to permit use of grades of direct consumption sugar which can be readily produced by these small plantation sugar houses, provided suitable methods are developed.

CHANGE IN LANGUAGE

The purpose of the changes in the wording of the appropriation bill for the Bureau of Chemistry and Soils is to make the language more definitive of the work of the Bureau, thereby rendering the intent and scope of the investigations more apparent to those charged with the approval of the estimates of the necessary funds.

The new language relates to work which has been transferred to this Bureau and new work for which funds were appropriated last year. In the interest of a more logical and effective grouping of the work and for the coordination of like activities, there has been transferred to this Bureau, by order of the Secretary of Agriculture, supervision of the investigational work on the pharmacological effects of insecticides for which funds were provided in the appropriation of the Bureau of Entomology and Plant Quarantine, and of the fruit and vegetable utilization and frozen pack investigations formerly conducted by the Bureau of Plant Industry. New language covering investigations on the chemical control of noxious weeds and plants is inserted to cover work which has recently been inaugurated under funds provided in the appropriation for the current year.

The wording which has been bracketed for omission from this item refers to activities which are being combined with other subappropriation items of this Bureau for the purpose of simplification of the estimates and for the more efficient administrative control of appropriated funds. The Budget estimates contemplate that the work on utilization of agricultural wastes and residues, formerly provided for in this item, be grouped with related work carried on under the former item "Color Investigations," and that these investigations be merged under a proposed new item "Industrial Utilization of Farm Products and By-Products." It is also recommended that the work on farm fires formerly included under this item be transferred and combined with "Plant Dust Explosions" under the new title "Agricultural Fires and Explosive Dusts."

WORK DONE UNDER THIS APPROPRIATION

General.--The agricultural chemical and technological research provided for under this appropriation is directed toward the objectives of (1) widening the markets for farm products through the development of more extensive uses, chiefly for food and feed purposes; (2) improvement in quality and better adaptation of products to market requirements; (3) discovery of uses for the constituents of hitherto unutilized plants and of new uses for minor crops which will lead to the substitution of these for overproduced crops; (4) development and substitution of domestic for imported agricultural products; and (5) reduction of losses from spoilage and deterioration of food and other agricultural products. This work involves fundamental research on the chemical nature of the numerous organic and inorganic constituents of agricultural products and technological application of the knowledge thus acquired to the solution of practical problems of utilization. Investigations are conducted on the chemistry, technology, processing, and utilization of cereals, fruits, vegetables, carbohydrate crops and products (sugars, starches, and miscellaneous carbohydrates), oils, fats, and waxes, and on proteins and vitamins. Fundamental research is conducted in biochemistry relating to agricultural products involving chemical, biochemical, microscopic, and microbial studies of foodstuffs in all phases of their evolution from food plants and raw materials to the finished manufactured products. Studies are also being conducted on problems dealing with the production and use of chemicals for the control of noxious weeds.

Cereals, Fruits, and Vegetables Investigations.--Work under this project is directed toward increasing the efficiency of recognized methods and developing new methods in the processing and preservation of food products, prevention of spoilage, and utilization of culls, surpluses, and wastes for the manufacture of food and other products. Cereal investigations include the



study of problems in milling, baking, and malting, with special reference to improving the quality of cereal products and to reducing the large losses from spoilage, such as those caused by staling and rancidity. Fruit and vegetable investigations are concerned with the various types of food preservation, economical utilization of culls and crop surpluses, and the development of valuable by-products. The portion of the fruit crop graded as culls often constitutes from 20 to 30 percent of the total crop and represents that much loss unless methods of profitable utilization are developed. In years of over-production the disposal of surplus products in the form of by-products also acts to stabilize the fresh market. One of the present problems of outstanding importance to the fruit industry is the satisfactory preservation of fruit juices, both fermented and unfermented. The type of fruit suitable for juice extraction is not suitable for direct sale, yet is highly palatable and of great dietary and commercial value. Of similar importance is the preservation of pulp fruit by freezing. Investigations are also conducted to improve processes for making pickles, vinegar, and allied products. Foods and food products with a value of more than \$3,000,000,000 come within the field served by this project. It is the aim of the work to increase this valuation by expanding the processing of farm products, thereby extending the market for raw materials and adding to the farm price.

Sugars, Starches, and Fats Investigations.---This work consists of chemical and technological research on the carbohydrate constituents of crops and derives farm products (such as sugarcane, sugar beets, honey, maple products, farm-made sugarcane and sorghum sirup, potatoes and other starchy plants, and plants containing miscellaneous carbohydrates) and on fats, oils, and waxes. The object of this work is to increase farm income from these crops and derived products by promoting wider and more profitable markets by improving the quality and increasing the utilization of their carbohydrate constituents. Investigations are conducted under this project to determine the identity, properties, and content of these carbohydrate constituents; to ascertain the factors which influence yield and quality of these constituents and derived products; to devise measures which will insure better and more uniform quality and better adaptation to market requirements; to originate new and diversified uses for carbohydrates; to increase the commercial use of minor crops, and to find means of utilizing uncultivated plants with the view of developing new and valuable crops for diversification. The work on fats, oils, and waxes (products which represent a value to the people of this country of over \$2,000,000,000) is directed toward obtaining new and more accurate data on their characteristics, composition, and properties so they may be produced, refined, and utilized to the best advantage from the standpoint of the producer, the processor, and the consumer.

Protein and Vitamin Investigations.---Under this project chemical and biological investigations are made of the nutritive value of foods and feeds, with particular reference to their protein and vitamin content - two of the most highly important elements in human and animal nutrition. Proteins differ greatly in their food value. They are complex compounds made up of over 20 constituents called amino acids. The nutritive value of a protein depends chiefly on its composition with respect to these amino acids. Digestibility of a protein depends on its structure. Exact information on the amino acid composition of proteins is meager and fragmentary. The investigations being conducted include isolation of the proteins from the raw materials, determination of their properties, composition, and digestibility; and studies on methods

of analysis of proteins and their constituent amino acids. Extension of our knowledge of the chemistry of proteins is important to the farmer, giving him the basis for the most efficient feeding of farm animals and for the most economic utilization of his crops. It is also essential for a determination of the use of proper human diet to maintain health and efficiency; for the right curative and preventive treatment of those suffering from allergic disturbances; for the development of technological uses of proteins in industry; and for advancement in the field of enzymes, serums, antitoxins, and immunization. Investigations of vitamins include a study of methods and technique of vitamin assay and studies of the effects upon vitamins of certain commercial processes used in the manufacture of food products.

Fundamental Investigations in Biochemistry Relating to Agricultural Products.--This project involves chemical, biochemical, microscopic, and microbial studies of foodstuffs in all phases of their evolution from food plants (or animals) to finished manufactured products. It is the purpose of this work to conduct specific fundamental studies that, because of their nature, can not be undertaken either by the individual food manufacturers or food organizations. Among the more important lines of work being conducted are the following: Research on the microbial spoilage of preserved foods--a phenomenon of widespread occurrence and of special importance now because of the rapid development of new processes for preserving foods; determination of the toxic effects which may result from consumption of foods contaminated with sprays, fumigants, food preservatives, and metals; prevention of rancidity in oil-bearing foods; development of methods to retard spoilage of eggs; isolation and identification of special constituents of plants and plant products that appear to be of special value in nutrition or in the arts--for example, the ursolic acid of apple pomace and other fruit waste; studies of the color formation of apples and the deterioration of color in tomatoes--factors of important bearing on the value of the products; research on the nature of various enzyme actions and their relation to the growth, spoilage, curing, and preservation of agricultural products. A proper understanding of the factors responsible for the biochemical changes in food plants and products is essential in preventing losses occurring in the growing, handling, storing, processing, and consumption of farm products and also has direct application in the improvement of processes which will enhance the quality and edibility of these products, with resultant increase in their use and in the returns to the farmers.

Chemical Weed Eradication Investigations.--Work done under this project is directed toward the development of chemical means for the elimination of the bindweed and other noxious weeds. Weeds cost the American farmer serious loss annually, through reduction of crop yields and quality and through increased cost of farm operations. Present investigations include (a) study of the economics and methods of manufacture of recognized chemical agents for the eradication of noxious weeds, with a view to reducing cost of these chemical agents to the farmer; and (b) the preparation of new chemicals suitable for use as herbicides. All work under this project is done in cooperation with the Bureau of Plant Industry.



EMERGENCY FUNDS

Direct Allotments

Projects	:	Obligated,
	:	1935
<u>Agricultural Adjustment Administration</u>	:	
(<u>Advances to Agricultural Adjustment</u>	:	
<u>Administration</u>):	:	
Transferred to Bureau of Chemistry and	:	
Soils for special chemical studies	:	
relating to expansion of markets for	:	
tobacco and sugar	:	\$915

(c) COLOR INVESTIGATIONS

Appropriation Act, 1936	\$69,757
Budget Estimate, 1937	---
Decrease	<u>69,757 (a)</u>

(a) The estimates for 1937 provide for the transfer and merging of this item with related work under the new item "Industrial Utilization of Farm Products and By-Products"

(d) INDUSTRIAL UTILIZATION OF FARM PRODUCTS AND BY-PRODUCTS

Appropriation Act, 1936	---
Allotments from:	
"Agricultural Chemical Investigations"	
(utilization of agricultural wastes) . . .	+ \$ 76,486
"Color Investigations" (technological	
utilization of farm products and by-	
products)	+ <u>69,757</u>
Total available, 1936	146,243
Budget Estimate, 1937	<u>171,243</u>
Increase	<u>25,000</u>

NOTE.--The foregoing allotments are carried forward by means of transfers in the estimates for 1937.

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PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase
<u>Obligated:</u>				
Hides and skins investigations	\$10,500	\$10,845	\$10,845	- -
Tanning materials and tanning processes investigations....	7,650	10,400	15,400	+ 5,000 (1)
Leather investigations	7,676	8,200	8,200	- -
Cotton fabric investigations	4,984	10,000	10,000	- -
Wastes investigations	25,000	27,641	47,641	+20,000 (2)
Fast dye investigations.....	18,905	10,300	10,300	- -
Biological stain investigations	11,950	13,800	13,800	- -
Fermentation investigations..	32,410	35,357	35,357	- -
Lignin investigations	7,855	9,400	9,400	- -
Organic synthesis investigations	4,024	10,300	10,300	- -
Total obligations.....	130,954	146,243	171,243	+25,000
<u>Unobligated:</u>				
Savings	35	- -	- -	- -
Total	130,989	146,243	171,243	+25,000

The increase of \$25,000 for 1937 includes:

(1) An increase of \$5,000 for the study of tanning materials, to develop new domestic sources of tannin. Plant, vegetable, and animal materials to the value of about \$25,000,000 are used yearly in this country in tanning and finishing leather. Domestic agriculture supplies only about half of these materials, of which the tannins are by far the most important. The vegetable tannins are essential for producing over 90 percent of the heavy leathers, like sole, harness, strap, belting, and bag leathers. Due to the inroads of the chestnut blight, domestic supplies of tannin are dwindling. Studies should be made of the recovery of tannin from agricultural by-products and waste products, which are now valueless and frequently an item of expense for disposal; of plants that might serve both as new farm crops and new sources of tannin; and of the influence of soil, season, climate, region, and altitude on the formation of tannin in plants and consequently on their yield of tannin. A successful solution of these problems will benefit consumers by providing cheaper sources of leather and will furnish new means of crop diversification.

(2) An increase of \$20,000 for the study of the production of cellulose, paper and board from farm by-products. The work is to be carried on at the Agricultural By-Products Laboratory at Ames, Iowa. There are at present more than 260,000,000 tons of farm by-products, such as the cereal straws, corn-stalks, corn cobs, etc., produced annually on American farms. Much of this is available for the manufacture of industrial cellulose, paper, press-board, and pulp, providing a market for raw fibrous materials amounting to more than \$100,000,000 annually. Recently developed processes and machinery give promise



for economic success along this line where standard processes and equipment have proven impracticable under present-day competitive conditions. It is proposed to apply these new processes and equipment experimentally to farm by-products with a view to their utilization on a tonnage basis and consequent greater annual return to the farmer.

CHANGE IN LANGUAGE

The proposed new title and new wording for this item are for the purpose of grouping under one subappropriation item related work dealing with the technical utilization of farm products and by-products. The new item combines the work covered by the former "Color Investigations" item with closely inter-related investigations formerly provided for under "Agricultural Chemical Investigations" under the wording "for investigation of the action and changes produced by microorganisms, including molds and fungi; for investigation and development of methods for the utilization of agricultural wastes and residues, in cooperation with the Bureau of Standards, Department of Commerce, without duplication of work", which wording has been deleted from the latter item. The clause "in cooperation with the Bureau of Standards" is omitted from the new item, as this wording is no longer necessary. Agreement has been reached between the two bureaus regarding this work, and the language formerly included in the appropriation for the Bureau of Standards covering this work, as well as the clause on cooperation without duplication, was dropped in the revamping of the Commerce bill last year.

WORK DONE UNDER THIS APPROPRIATION

The work under this appropriation is concerned with the industrial utilization of farm products, by-products, wastes, and surpluses through the application of chemical, physical, and technological methods, including the changes produced by micro-organisms, such as yeasts, bacteria, molds, and fungi. The work comprises studies relating to the conservation of hides and skins, serviceability of leather, development of new sources of tanning materials to supplement our dwindling national supplies; the weather and mildew-proofing of cotton fabrics; the industrial utilization of straw, cornstalks, hulls, etc., to increase the net returns from crops; the utilization of agricultural wastes, such as fruit and cannery wastes, etc.; research in the chemistry of lignin to provide an outlet for the 40,000,000 tons of this material now produced annually; the development of fast dyes for agricultural fibers, such as cotton, the synthetic cellulose fibers, and wool; the development and standardization of biological stains required in the study of plant and animal diseases and all biological research; the application of organic synthesis to agricultural raw materials; the application of micro-organisms to the production of valuable substances from agricultural crops and by-products.



EMERGENCY FUNDS

Direct Allotments

Projects	Obligated, 1935
<u>Public Works Allotments (National Industrial Recovery Act):</u>	
Construction of agricultural by-products laboratory, Ames, Iowa . . .	\$33,404

(e) PLANT DUST EXPLOSIONS

Appropriation Act, 1936	\$ 34,881
Budget Estimate, 1937	- -
Decrease	<u>34,881 (a)</u>

(a) The estimates for 1937 provide for the transfer and merging of this item with related work under the new item "Agricultural Fires and Explosive Dusts."

(f) AGRICULTURAL FIRES AND EXPLOSIVE DUSTS

Appropriation, 1936	- -
Allotments from:	
"Plant Dust Explosions"	\$ 34,881
"Agricultural Chemical Investigations" (work on farm fires)	<u>13,522</u>
Total available, 1936	48,403
Budget Estimate, 1937	<u>58,403</u>
Increase	<u>10,000</u>

Note.---The foregoing allotments are carried forward by means of transfers in the estimates for 1937.

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase
<u>Obligated:</u>				
Agricultural fires	\$11,244	\$13,522	\$23,522	+ \$10,000 (1)
Explosive dusts	32,133	34,881	34,881	- -
Total obligations.	<u>43,377</u>	<u>48,403</u>	<u>58,403</u>	<u>+ 10,000</u>
<u>Unobligated:</u>				
Savings	1,454	- -	- -	- -
Total.	<u>44,831</u>	<u>48,403</u>	<u>58,403</u>	<u>+ 10,000 (1)</u>



(1) An increase of \$10,000 for agricultural fires investigations.

The annual loss from fires on farms amounts to approximately \$100,000,000, with a loss of approximately 3,500 lives. The loss from fires on farms and in rural communities amounts to about \$225,000,000 annually, or more than \$600,000 every day. This is at least 70 percent of the entire national fire loss. This farm fire loss means a farm "fire tax". The average farm "fire tax" in 1934 was about \$16 per farm. In many of the States it is greater than the per capita tax for State government. The annual loss due to the spontaneous heating, spoilage, and deterioration of hay amounts to more than \$60,000,000. On account of limited funds, the research work has been confined principally to experimental work relating to the spontaneous heating of alfalfa hay. It is planned to extend the scope of the research work to include other kinds of hay and to other agricultural products, such as manure, grains, mixed feeds, and commercial fertilizers. Experimental work will be carried on in cooperation with the agricultural experiment stations in the various States concerned with this problem. This research work will be supplemented by field studies and large-scale experiments at selected points of storage of agricultural products, as, for example, in warehouses, grain elevators, and feed manufacturing plants.

CHANGE IN LANGUAGE

The proposed new title and new wording for this item are for the purpose of combining closely related lines of work. The new item combines the plant-dust explosion work with the farm-fire investigations formerly included under the item "Agricultural Chemical Investigations." It is desired to centralize the research in the Bureau on fires and explosions associated with agricultural products in the Chemical Engineering Division and to provide for these investigations under one appropriation item for more effective grouping and control.

WORK DONE UNDER THIS APPROPRIATION

Work under this appropriation includes studies of dust explosions and explosion hazards in grain-handling operations and in industrial plants handling products of agricultural origin, experimental chemical research and development work on the prevention of dust explosions and resulting fires, and the practical application of the results of this research. Special attention is being given to the development of safety codes for dust-explosion prevention. Chemical and engineering research is also conducted on the causes of self-heating of agricultural products and on the development of equipment and methods for the prevention and control of farm fires. Active cooperation is carried on with farm organizations, agricultural experiment stations, industrial companies, insurance organizations, State commissions, fire prevention associations, safety organizations, and other interested agencies in the practical application of the results of this research work and in the preparation of protective measures. These investigations are directly concerned with saving human life and property. In the past 19 years (the period for which accurate records are available) there have been more than 380 dust explosions in the United States in connection with the handling, milling, and processing of products largely of agricultural origin. In these explosions 308 persons were killed and 691 were injured. The property losses amounted to more than \$35,000,000. At least one-tenth of the harvested hay crop, the total value of which in 1934 was \$700,000,000, is lost by spontaneous heating. With practically every new development for the utilization of agricultural products it



is necessary to work out new methods for protection from dust explosions and agricultural fires.

(g) NAVAL STORES INVESTIGATIONS

Appropriation Act, 1936	\$76,741
Budget estimate, 1937	<u>79,241</u>
Increase	<u>2,500</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase
<u>Obligated:</u>				
Composition, properties and uses of naval stores. . . .	\$19,608	\$36,741	\$39,241	+\$2,500 (1)
Technology of naval stores production.	40,034	40,000	40,000	- -
Total obligations . . .	59,642	76,741	79,241	+ 2,500
<u>Unobligated:</u>				
Savings	229	- -	- -	- -
Total	59,871	76,741	79,241	+ 2,500 (1)

(1) An increase of \$2,500 for carrying out the provisions of the Act "Providing for the Publication of Statistics Relating to Spirits of Turpentine and Rosin", approved August 15, 1935 (49 Stat., 653). No funds were provided by this Act, and the Bureau has no available funds for carrying out the work authorized.

CHANGE IN LANGUAGE

The suggested changes in language in this item are wholly for purposes of clarification. The new phraseology defines more clearly the scope and character of the work conducted under this appropriation, including the assembling and compilation of data on naval stores as authorized by the Act of August 15, 1935.

WORK DONE UNDER THIS APPROPRIATION

The purposes of the work under this appropriation are to improve agricultural-chemical-technological practices, processes, and equipment for the production of turpentine, rosin, and related products, so as to prevent deterioration and waste, reduce costs of production, and obtain products of better quality; to promote the utilization of turpentine and rosin and related products through fundamental studies of their chemical composition and properties; and through applied chemical research to develop processes and equipment for improving established products and especially to develop new uses for the great increase in production anticipated within a few years. More than 12,000 farmers of the South produce turpentine and rosin. Approximately 60,000 people are

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employed in naval-stores production and distribution. The average annual value of naval stores is approximately \$40,000,000. Naval stores are important day-to-day cash crops of the South, affording a living to more than 300,000 persons and providing the major business of large areas of the South. Today's average annual production is approximately 500,000 fifty-gallon casks of turpentine and 1,660,000 500-pound barrels of rosin, with an assured potential production through voluntary re-growth of pine timber of three or four times as much within 25 years. As there is no visible outlet for this increased production, it must be found through research. Investigations on naval stores bring greater returns to the turpentine farmer and have a direct bearing on the economic maintenance of the pine forests of the South, thus also helping to keep submarginal lands out of other agricultural crops for which they are neither suited nor needed. The recently established naval stores experiment station in the Osceola National Forest offers facilities not available elsewhere for research on the technology of naval-stores production in cooperation with the forest management research of the Forest Service.

EMERGENCY FUNDS

Direct Allotments

Projects	: :Obligated, : 1935	: Estimated :obligations, : 1936
<u>Public Works Allotments (National Industrial Recovery Act):</u>	:	:
Construction of laboratory and office building at Naval Stores Station, Olustee, Fla.	: : : \$ 21,454	: : : - -
<u>Emergency Relief Appropriation Act of 1935:</u>	:	:
Construction of electric power line to Naval Stores Station, Olustee, Fla.	: : : --	: : : \$20,000

(h) SOIL SURVEY

Appropriation Act, 1936	\$286,208
Budget estimate, 1937	<u>381,208</u>
Increase	<u>95,000</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase
<u>Obligated:</u>				
Investigations, classification, and mapping of soils in the field	\$147,692	\$215,670	\$295,670	+ \$80,000 (1)
Field inspection of soil surveys and correlation of soil types and series	25,496	32,788	32,788	- -
Adjusting, constructing, and drafting soil maps and charts for reproduction	28,030	37,750	52,750	+ 15,000 (2)
Total obligations.	201,218	286,208	381,208	+ 95,000
<u>Unobligated:</u>				
Legislative impoundments	500	- -	- -	- -
Other amounts unobligated	673	- -	- -	- -
Total	202,391	286,208	381,208	+ 95,000

The increase of \$95,000 for 1937 includes:

(1) An increase of \$80,000 for the soil survey of rural areas where problems of land use are critical. Soil maps furnish the only sound basis for the development of land policies that may guide the necessary adjustments in the use of rural lands. There is and has been, especially during the past two years, an unprecedented demand for soil surveys. Local and State governments are striving toward a better utilization of their lands with the assistance of several Federal agencies. It is imperative that the Federal Soil Survey comply with their demands for soil surveys to the utmost limit of its ability, since such data furnish the indispensable ground work for their land programs.

Present funds do not allow full cooperation with the field work with those States desiring to cooperate. Many States are willing and anxious to cooperate financially in making these surveys but require the assistance of technically trained personnel and the background of experience of the Federal Soil Survey for guidance. No other agency has the experience, organization, or personnel necessary for performing this essential research.

The extensive program of the administration for adjustment of rural land use has placed a very heavy burden on the Soil Survey for the interpretation of existing soil maps and construction of new soil maps in critical areas. Naturally these demands have materially retarded the cooperative work of the Soil



Survey with the States. The increase requested will enable the continuation of the Department's policy of cooperation with the States for conducting this important research.

(2) An increase of \$15,000 for map drafting work in the preparation of soil maps for publication. With the great increase of the cooperative field work in the States, and as the demands for greater detail in the soil maps have increased, the work of the drafting section has been greatly increased. At the present time there is too great a delay in the publication of the soil surveys because of inadequate facilities in the drafting section. Because of the large amounts of funds being devoted to the field work by the States, the number of maps to be constructed has increased so rapidly that the present Federal field personnel is unable to handle the work promptly. As the soil maps become more detailed, more work is required in preparing them for reproduction. It is essential that the field data be prepared for publication promptly.

CHANGE IN LANGUAGE

The immediate/^{ly} available clause in the 1936 appropriation bill "of which \$10,000 shall be immediately available" has been deleted. The emergency situation relating to funds for soil-survey work during the fiscal year 1935 does not now exist.

WORK DONE UNDER THIS APPROPRIATION

The object of the Soil Survey is to classify and map soils of the United States; and to describe their characteristics, particularly in reference to the growth of various crops, grasses, and trees. The ultimate purpose is to provide accurate soil maps of the country necessary for the classification of rural lands and for the factual basis in the development of any rational program of land use, whether by public agencies or the individual farmer. The work comprises the determination of the character of soils, the definition of soil types, development of a uniform system of classification for the Nation, delineation upon maps of the boundaries of each type, the correlation of the various soil types in the country, and the interpretation of their relationship to the production of crops, grasses, and trees. This information is made available in published form to those interested in all phases of agriculture and other problems of land use. State cooperating agencies and other public organizations are furnished advance photographic copies of the field work for their immediate use where needed at once. Essentially all of the work is accomplished in financial cooperation with the various States and is necessary to them for the development of programs for the readjustment of their agriculture on a sound basis. Especially during the latter part of the fiscal year special reports and surveys were made for various other Governmental agencies which have need for physical data regarding land in order to develop the programs which are under their responsibility.

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EMERGENCY FUNDS

Direct Allotments

Projects	Obligated, 1935	Estimated obligations, 1936
<u>Territory of Hawaii Trust Funds,</u> <u>Processing Taxes, Sugar</u> (authorized by Sec. 15(f), Agricultural Adjustment Act, as amended - Hawaii Tax Fund Orders Nos. 1 and 2):		
Soil surveys in Hawaii	\$ 4,070	\$10,930
<u>Puerto Rico Trust Funds, Processing</u> <u>Taxes, Sugar</u> (authorized by Sec. 15(f), Agricultural Adjustment Act, as amended - Puerto Rico Tax Fund Orders No. 1 and 7):		
Soil surveys in Puerto Rico	12,594	27,406
Total, Trust Funds, Processing Taxes, Sugar	16,664	38,336
<u>Loans and Relief in Stricken Agricultural</u> <u>Areas:</u>		
Transferred from Forest Service for special soil studies in connection with establishment of Great Plains Shelterbelt	12,903	- -

(i) SOIL CHEMICAL AND PHYSICAL INVESTIGATIONS

Appropriation Act, 1936	\$ 68,081
Budget estimate, 1937.	<u>78,081</u>
Increase	<u>10,000</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase
<u>Obligated:</u>				
Chemical and physical analyses and tests of soils and soil materials	\$13,540	\$14,000	\$14,000	- -
Investigations of the chemical and physical properties of soils..	36,820	39,081	49,081	+10,000(1)
Selenium investigations.	- -	15,000	15,000	- -
Total obligations	50,360	68,081	78,081	+10,000
<u>Unobligated:</u>				
Legislative impoundments	150	- -	- -	- -
Other amounts unobligated.	182	- -	- -	- -
Total	50,692	68,081	78,081	+10,000



(1) An increase of \$10,000 for coordination of soil tests for agronomic control. Great interest has recently developed in the use of "quick tests" for determining the needs of soils for fertilizers and other soil amendments. Many such tests have been developed both in Europe and America. They involve such determinations as soil acidity, lime requirements, phosphorus, maganese, magnesium, iron, copper, and boron, as well as nitrogen and potash requirements. It is not known how general is the applicability of any of these now how reliable they are locally. It is necessary that these tests be examined comparatively and that tests be developed which are generally reliable and which are adapted to specific soil types. County agents and others who have to make fertilizer recommendations are greatly in need of reliable tests to be used as a basis for their suggestions. The importance of minor essential elements in soils is being recognized and the problem of soil deficiencies is being actively studied. Suitable tests for these purposes are in most cases not available. It is important that the whole question of soil testing and of control processes be studied by a central agency which can maintain standard samples, establish standard methods, and determine the tests best suited to local environments.

WORK DONE UNDER THIS APPROPRIATION

Work under this appropriation includes research on the chemical and physical properties of soil components and their significance in soil classification and other phases of soil science; study of the selenium content of soils and its relation to toxicity of vegetation grown thereon; and chemical and physical analyses and tests of soils and soil materials chiefly for the soil survey and other government agencies. Service work for the government agencies consists of mechanical analyses and chemical determinations which are required for specific problems in soil survey, erosion control, plant industry, animal industry, buildings and grounds projects, and other problems relating to soils and soil materials. Research work is at present largely centered on soil colloids - the active components of the soil, a thorough knowledge of which is essential to satisfactory classification of soils for land utilization and land conservation; study of soil organic matter, including chemical research on peat, with a direct bearing on the utilization of 110,000,000 acres of domestic peat deposits; and investigations of soil moisture relationships. Selenium investigations are concerned with the determination of the extent and intensity of the selenium toxicity of soils, a condition which exists in more or less acute form in widely distributed areas in the Middle West and which results in the growth of toxic vegetation responsible for certain animal diseases in the sections affected.

EMERGENCY FUNDS

Direct Allotments

Projects	:
	:Obligated,
	: 1935
<u>Emergency Conservation Work</u> (authorized	:
by Act of March 31, 1933; allotment from	:
War Department):	:
Investigations of soils and related	:
material for selenium content	: \$14,137
	:

(j) FERTILIZER INVESTIGATIONS

Appropriation Act, 1936 \$269,595
 Budget estimate, 1937 269,595

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Mixed fertilizer investigations	\$58,405	\$59,200	\$59,200
Potash fertilizer investigations	32,049	31,000	31,000
Phosphate fertilizer investigations	22,915	26,015	26,015
Nitrogenous fertilizer investigations	32,800	34,370	34,370
Catalyst investigations	30,955	32,440	32,440
Biochemical nitrogen-fixation investigations	27,175	29,880	29,880
Fundamental physical and chemical fertilizer investigations	55,150	56,690	56,690
Total obligations	259,449	269,595	269,595
<u>Unobligated:</u>			
Legislative impoundments	1,000	--	--
Other amounts unobligated	394	--	--
Total	260,843	269,595	269,595

WORK DONE UNDER THIS APPROPRIATION

Work under this appropriation consists of investigations on the chemistry, physics, technology, and production of the fertilizer ingredients, nitrogen, phosphoric acid, potash, and other soil amendments such as lime, sulphur, magnesium and manganese. The work has for its purpose the development of methods for the utilization of our many natural resources and by-products in order to give the farmers the greatest value for the money they invest in plant food. The farmers of the United States normally use from 7,000,000 to 8,000,000 tons of commercial fertilizer each year at a cost of approximately \$250,000,000. The research is directed toward the development of more efficient and economical manufacturing processes; production of new fertilizer compounds, such as calcined phosphate, urea, and ammoniated peat; improvement in the quality of fertilizer materials to give maximum beneficial effects to crops and soils and improvements in their physical condition to facilitate handling and distribution in the field; increasing the concentration of fertilizers and eliminating fillers to reduce handling, bagging, storage, and transportation costs; and utilization of new sources of raw materials, of low-grade materials formerly wasted, and of by-products from the industries. The solution of these main

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problems also calls for the use of many fundamental chemical and physical data which can be obtained only by a comprehensive research program.

The development of suitable fertilizers and methods for their more effective use have important bearing on the proper utilization of land and on rehabilitation problems, as a means for converting large areas from marginal to highly productive lands.

The work includes investigations of the preparation, properties, and efficiency of mixed fertilizers, the transformation and utilization of potash-containing materials, development of new processes of making phosphate fertilizers, preparation of organic and synthetic nitrogen products, development and improvement of catalytic procedures for use in fertilizer production, biochemical nitrogen-fixation investigations, and physical and chemical investigations, including X-ray, crystallographic, spectroscopic, photochemical, high-pressure and high-temperature studies, and mathematical analysis as applied to fertilizer and related agricultural problems.

EMERGENCY FUNDS - BUREAU TOTAL

Summary

Projects	:	:	Estimated
	:	Obligated,	obligations,
	:	1935	1936
<u>Direct Allotments:</u>	:	:	:
Agricultural Adjustment Administration	:	:	:
(Advances to A.A.A. for special chemical	:	:	:
studies relating to expansion of markets	:	:	:
for tobacco and sugar.	:	\$ 915	- -
Public Works Allotments, N.I.R. (physical	:	:	:
improvements)	:	54,858	- -
Emergency Conservation Work (selenium	:	:	:
investigations)	:	14,137	- -
Loans and relief in stricken agricultural	:	:	:
areas (shelterbelt project)	:	12,903	- -
Emergency Relief Appropriation Act of	:	:	:
1935 (physical improvements).	:	- -	\$20,000
Hawaii and Puerto Rico Trust Funds, Sugar	:	:	:
Processing Taxes (for soil surveys in	:	:	:
Hawaii and Puerto Rico)	:	16,664	38,336
Total, Emergency Funds	:	99,477	58,336

PASSENGER-CARRYING VEHICLES

The authorization for purchase of passenger-carrying vehicles contemplates an increase of \$650 (\$1,770 in 1936; \$2,420 estimated for 1937) for this purpose. As shown by the Budget schedule, the authorization of \$2,420 will enable the replacement of 3 of the cars now in use and the purchase of one additional car. The replacements are necessary in order to obviate the continued use of worn-out cars at excessive maintenance costs. The three automobiles to be replaced in 1937 will have been in service from three to five years at that time. The additional car to be purchased is needed for the Soil Survey as a result of the expansion of this work, in order to permit adequate inspection and supervision of the increased number of areas in which soil-survey work is being conducted.

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

(a) GENERAL ADMINISTRATIVE EXPENSES

Appropriation Act, 1936.....	\$162,288
Budget Estimate, 1937.....	<u>164,288</u>
Increase.....	<u>2,000</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase
<u>Obligated:</u>				
General administration and business service	\$158,104	\$162,288	\$164,288	+ \$2,000 (1)
<u>Unobligated:</u>				
Legislative impoundments.....	80	---	---	---
Other amounts unobligated.....	265	---	---	---
Total	158,449	162,288	164,288	+ 2,000 (1)

(1) An increase of \$2,000 to provide additional library assistance. The present staff of three workers is entirely inadequate to meet the demands for library assistance. They do not have opportunity to abstract or classify publications so they may be fully available to the workers in the Bureau. There is, therefore, duplication of work and lost effort because individual investigators have to consult large numbers of periodicals for the literature dealing with the problems to which they are assigned. A single handling of these publications by competent library assistants would permit the indexing of articles on the various subjects so that they would be readily available to the individual investigators without undue loss of time. The activities of the Bureau of Entomology and Plant Quarantine require much additional work in the library, and the number of individuals responsible for the care, maintenance, and classification of the extensive literature on entomology and kindred subjects is less than those available for the work four years ago.

WORK DONE UNDER THIS APPROPRIATION

The funds provided under this appropriation are used for general administrative purposes comprising the following functions: (a) Determination of policies; (b) general administrative supervision of all Washington, D. C., and field activities; (c) business operations; (d) approval and preparation for publication of manuscripts concerned with the scientific, technical, and other activities of the Bureau; (e) preparation and distribution of general information on control of insect pests; (f) maintenance of a comprehensive library of entomological literature and preparation of bibliographies on entomological subjects; (g) handling of general information relating to Federal quarantines and the preparation of cases on quarantine violations.

EMERGENCY FUNDS

Direct Allotment

Projects	Obligated, 1935	Estimated obligations, 1936
<u>Public Works Allotment (National Industrial Recovery Act):</u>		
Physical improvements	\$144,733	\$1,150

(b) FRUIT INSECTS

Appropriation Act, 1936 \$399,531
 Budget Estimate, 1937 399,531

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Apple and pear insect investigations ...	\$47,624	\$94,670	\$94,670
Peach insect investigations	41,075	41,800	41,800
Grape insect investigations	5,791	10,995	10,995
Nut insect investigations	19,923	20,500	20,500
Dried fruit insect investigations	15,505	16,002	16,002
Citrus and other subtropical fruit insect investigations	39,921	41,020	41,020
Investigations of fruit flies which are potential pests in continental United States	54,194	56,411	56,411
Investigations of the insecticidal value of oils	4,984	5,120	5,120
Investigations of Japanese and Asiatic beetles	107,039	113,013	113,013
Total obligations	336,056	399,531	399,531
<u>Unobligated:</u>			
Legislative impoundments	240	---	---
Other amounts unobligated	2,443	---	---
Total	338,739	399,531	399,531

WORK DONE UNDER THIS APPROPRIATION

General.-- The activities under this item are concerned with the investigation and development of control measures for insects affecting fruits, fruit trees, nuts, grapes, and those small fruits which have their seeds internally, such as blueberries and cranberries. Investigations on the Japanese and Asiatic beetles and fruit flies--such as the Mediterranean fruit fly and the Mexican fruit fly--are also carried on under this item. Field laboratories at which investigations are conducted and where growers may obtain information as to control of pests are maintained in the principal fruit-growing regions of the country. Temporary laboratories are also maintained at certain places outside the continental United States as headquarters for investigations on fruit flies and for the collection and preparation for shipment into the United States of natural enemies which may aid in the control of various pests.

Apple and pear insect investigations.-- Practically all the funds provided under this project are allotted for the development of effective and economical means of controlling numerous pests of apples. The standard control for the codling moth leaves harmful insecticidal residues on the harvested fruit and presents such a critical situation and such a difficult problem that funds under this project are being devoted almost exclusively to investigations on the codling moth. The use of the standard insecticide, arsenate of lead, for the control of the codling moth leaves residues of lead and arsenic which may be injurious to human health. This condition is corrected in part by washing the fruit in dilute hydrochloric acid or other solvents to remove excessive residue. This operation is costly and cannot be economically applied throughout the entire country. Effective substitutes for the method of control now recommended are needed at as early a date as practical. The investigations now under way include laboratory and field tests on new insecticides, control by traps and baits, and the use of cultural practices and natural enemies.

A small part of the funds under this project are used for incidental investigations on such pests as the wooly apple aphid, the tarnished plant bug, and the pear thrips. The losses caused by the pear thrips during the past few years have been especially heavy, and cooperative studies have been begun with the Oregon Agricultural Experiment Station.

Peach insect investigations.-- Funds allotted to this project are used for investigations on the Oriental fruit moth, the plum curculio, the San Jose scale, and the peach tree borer. In the absence of effective insecticidal control for the Oriental fruit moth, emphasis is being placed on the control of this pest by natural enemies. Certain native parasites have proven to be effective, and these are being colonized in areas recently infested by the moth. In addition to colonization of native parasites, special attention is devoted to the importation and colonization of parasites from Japan. Several very promising parasites have been imported from the Orient and are being propagated at the laboratory at Moorestown, New Jersey, for liberation in infested areas. In some limited sections parasites have become sufficiently well established to bring about very appreciable control. A certain part of the work on colonization of introduced parasites or redistribution of native forms is carried on in cooperation with State agencies. Further work in this field should be of material benefit to other sections of the extensive area now infested by this pest.

In addition to work on parasites for the control of the Oriental fruit moth, certain studies are under way on the possibility of utilizing baits. To more effectively carry on these studies this work was transferred from Cornelia, Georgia, to Moorestown, New Jersey. The studies of the past season have been largely an effort to determine the attractive principle of promising baits, and chemists have aided in this work.

Investigations on the plum curculio and peach tree borer are being carried on at the laboratory in Fort Valley, Georgia. In the case of the curculio special attention is being directed toward the development of measures for control which will not require the use of lead arsenate throughout the season. When so used in areas where two broods of the curculio occur, objectionable residues may remain on the fruit after harvest and no method for its removal is available. In the studies on the peach tree borer special attention is given to experiments to determine its relationship to the phony peach disease and to develop means for disinfecting nursery stock so as to eliminate infestation by the borer and thus reduce the danger of its carrying this peach disease into uninfested regions. The residual effect of lime-sulphur as an aid in control of the San Jose scale is also being studied.

Grape insect investigations.--- The major problem being studied under this project is the development of effective means of controlling the grape berry moth without causing objectionable spray residues. Studies are under way to determine the practicability of modifying cultural practices so as to keep down heavy infestations, thus reducing the number of spray applications necessary. Investigations on insecticides other than those which leave objectionable spray residues are also under way. Many of those tested remove the "bloom" of the grape desired especially for table varieties. The impracticability of washing grapes increases the difficulty of solving this problem. Changes in materials used in sprays or in the spray schedule also affect the control of certain other pests, such as the grape root worm, the rose chafer, and the leaf roller, which have heretofore been held under control by sprays applied for the grape berry moth. Small amounts are used for studies on two of the more important of these.

Nut insect investigations.--- The funds allotted to this project are used for the development of methods of controlling insects attacking pecans. These studies include investigations on such pests as the nut case bearer, shuckworm, pecan phylloxera, pecan black aphid, and the obscure scale. Effective controls for these pests are not available under all conditions existing throughout the area where pecans are produced. The controls applied in some sections are unsuitable in others. In some sections the use of oil sprays for the control of scale has caused considerable tree injury not experienced in other localities. Recent studies have indicated that lead arsenate may be safely and effectively used for the control of certain species under conditions in Texas but it causes some foliage injury in the eastern section. Field laboratories are maintained at Albany, Georgia; Brownwood, Texas; and Shreveport, Louisiana. The studies to develop controls for these pests should be continued in order that the rapidly developing pecan industry may be aided in the many unsolved problems in insect control.

Dried fruit insect investigations.--- The work under this project is concerned with insects attacking dried fruits and the determination of methods

for their control. Many of the insect pests found in dried fruit occur in and infest the fruit in the orchard as well as when it is being dried and stored. These activities are largely centered in the laboratory at Fresno, California, and many of them are carried on in cooperation with the University of California and the Dried Fruit Association of California. Special attention is being given to determine ways of protecting drying fruit from insect attack; to determine dosages and methods of fumigating infested fruit; to prevent growing figs from being infested; and to learn the habits of the insects to determine the relation to infestation of dried fruit.

Citrus and other subtropical fruit insect investigations.-- Funds allotted for this project are used for studies on the control of certain insect pests of citrus. Work is carried on at field laboratories maintained in Florida and California. In California particular attention is devoted to the development of effective methods of controlling the California red scale and citrus thrips. Methods for control of the red scale previously worked out have been found to be ineffective in certain sections where the insect seems to be resistant to the standard methods of control by fumigation. In this same general section the control of the citrus thrips by the use of sulphur is not fully effective. The method and time of application of various controls require further study. Work in California is carried on in cooperation with the California Citrus Experiment Station and coordinated with that done by other agencies.

In Florida special studies are being conducted in cooperation with the Bureaus of Plant Industry and Chemistry and Soils on the effect of insecticides on citrus trees and fruits. Similar tests are also being applied in the Lower Rio Grande Valley of Texas. The use of sulphur for the control of rust mites and certain scale insects is also being studied in Florida. Special emphasis is being placed on the timing of applications and the relation of the dosages, including determination of the period during which sulphur may remain on the foliage in sufficient amounts to be effective.

Investigations of fruit flies which are potential pests in the continental United States.-- The work under this project is concerned with investigations on the biology and methods of controlling certain important fruit flies in their native regions in order to provide information which will aid in preventing them from entering the United States and the development of methods for their control if they should become established in the United States. The investigations are headquartered in Honolulu, T. H.; Mexico City, Mexico; Balboa, Canal Zone; and Mayaguez, Puerto Rico. The work in Hawaii is concerned with the Mediterranean fruit fly. Special attention is now being directed to the development of bait sprays to be used in controlling the adults, development of attractants that may be used in traps, and determination of more effective methods for the disposal of waste or culled fruit. Additional tests to determine the time interval when certain high and low temperatures are fatal to the fruit fly are also under way. In Mexico City special attention is directed to the Mexican fruit fly and certain related species. Particular attention is now being given to developing attractants that can be used in traps to detect the presence of the fly and sprays to aid in its control. Such information is particularly needed in connection with the work in the Lower Rio Grande Valley in Texas. Some very promising leads have been developed, and it is hoped that it will soon be possible to use a

bait spray which is more effective than the one containing nicotine sulphate now being used in the Lower Rio Grande Valley of Texas. The work in the Canal Zone is concerned with studies on the life history, habits, and hosts of numerous species of fruit flies which occur there and which are a menace to the fruit cultures of the United States. In Puerto Rico experiments are under way to determine more effective methods of eradicating the West Indian fruit fly, its relation to various hosts, and the effectiveness of different sprays and attractants.

Investigations of the insecticidal value of oils.-- Oil sprays are coming into more extensive use for the control of all kinds of insect pests on deciduous fruit trees. Basic information is urgently needed to determine the possibility of using highly refined oils for this work. The work under this project is designed to develop this information. These studies, which include cooperative work with entomologists and chemists of the Insecticide Unit, are being carried on at a laboratory maintained at Wooster, Ohio, in cooperation with the Ohio Agricultural Experiment Station. Particular attention is directed to the development of oil sprays that may be used during the dormant period to kill the eggs of certain insects that hibernate in this stage and to kill dormant scale insects and hibernating worms.

Investigations of Japanese and Asiatic beetles.-- Funds provided under this project are used for investigations to determine methods of control for three introduced pests of major importance--Japanese beetle, Asiatic garden beetle, and Oriental beetle. These insects are spreading into new regions and the area in which they occur in destructive numbers is increasing. This presents many new problems for control and makes it necessary to determine the applicability of measures now used in these new areas. Recent studies have shown that the effectiveness of the treatment of the soil with lead arsenate to kill the grubs varies with the type of soil. It will be necessary to further test this standard treatment and to endeavor to develop new methods of control. The life history of the beetle differs in parts of its present range, and this has a bearing on the timing of control operations as well as the possible utilization of natural enemies. The Asiatic garden beetle has attacked vegetable crops in new areas, emphasizing the need for more work on this pest to determine ways of protecting these crops.

The work under way is concerned with the development of more effective methods of control of these pests by the use of insecticides by artificial means, the introduction and colonization of parasites which may aid in reducing their numbers, and the determination of methods of treating plants or plant products which may carry this pest into uninfested regions. Investigations to determine more effective methods of controlling adult beetles include work on traps that may reduce their numbers or detect their presence at points where the infestation is very light, and the development of killing sprays or repellents which may be used in protecting various plants and fruits which are severely injured by the feeding of the adult beetles. Investigations on the grub include tests on various insecticides that may be added to the soil and the method of application. Soil microorganisms not only attack the grubs directly but also modify the effectiveness of other treatments and are being studied cooperatively. These infestations are headquartered at a laboratory at Moorestown, New Jersey, with sublaboratories in other sections, including Japan, for the purpose of collecting and importing natural enemies.

EMERGENCY FUNDS

(1) Direct Allotments

Projects	Obligated, 1935	Estimated obligations, 1936	Estimated obligations, 1937
<u>Public Works Allotments (National Industrial Recovery Act):</u>			
Spray residue investigations	\$64,806	\$1,700	---
<u>Territory of Hawaii Trust Fund, Processing Taxes, Sugar (authorized by Sec. 15(f), Agricultural Adjustment Act, as amended; Hawaii Tax Fund Order No. 3):</u>			
For developing methods of controlling fruit flies in Hawaii	---	64,900	\$15,100
Total Emergency Funds (Direct Allotments)	64,806	66,600	15,100

Territory of Hawaii Trust Fund.--- The investigations carried on under this allotment are directed to develop aids for the control of the Mediterranean fruit fly and melon fly in Hawaii. They consist of (1) explorations to locate possible natural enemies which may be introduced and colonized in the islands; (2) study of insecticides that may be used in sprays and of attractants that may be used in traps to aid in reducing the damage caused by these pests; and (3) tests to determine ways of treating fruit produced in Hawaii to kill any immature stages of the fruit flies. The activities are directed towards the control of these pests in sections where they are established, in contrast to the studies carried on under regular appropriations which aim to develop facts which will aid in preventing the introduction of these pests into the continental United States or combat them should they become established locally. The two lines are directed by this Bureau and are closely coordinated. Those conducted under the special allotment are carried on cooperatively with responsible local agencies.

(2) Indirect Allotments

The local administrator of Emergency Relief Funds in New Jersey has supplied varying numbers of relief laborers to aid in operations conducted in connection with investigations of the Japanese beetle at the laboratory at Moorestown, New Jersey. This labor has been used to collect beetles, dig grubs which are needed in experimental work, wash glassware, type notes and records, and perform other tasks. The availability of this help has made it possible to carry on a larger number of tests and has thus expedited the work.

(c) JAPANESE BEETLE CONTROL

Appropriation Act, 1936, \$350,000
Budget Estimate, 1937, 350,000

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Supervision of nurseries and green-houses	\$150,321	\$170,000	\$170,000
Scouting adjacent to nurseries and greenhouses	11,579	19,600	19,600
Trapping to determine distribution ...	46,318	86,000	86,000
Trapping control	- -	16,000	16,000
Farm products inspection	5,085	26,000	26,000
Vehicular inspection	25,206	22,400	22,400
Transit inspection	- -	3,500	3,500
Tests on treatment of regulated products	- -	6,500	6,500
Total obligations	238,509	350,000	350,000
<u>Unobligated:</u>			
Legislative impoundments	160	- -	- -
Other amounts unobligated	3,281	- -	- -
Total	241,950	350,000	350,000

WORK DONE UNDER THIS APPROPRIATION

General.--- The funds provided under this appropriation are used for the control and prevention of spread of the Japanese beetle, including the determination of spread, enforcement of quarantine regulations to retard spread into new localities, and inspection and certification of nursery stock and other materials the movement of which is regulated under Federal and State quarantine. In cooperation with the State and local agencies, control measures are conducted to suppress the beetle at points considerable distances from the generally infested area to prevent developing new centers of spread. During the past season the Japanese beetle has been more than usually destructive in many sections of the generally infested area. Scouting and trapping operations carried on during this season to discover its possible presence in localities outside the known infested area indicate established infestations at a number of new points. The occurrence of the beetle in these new areas may make it necessary to modify the Federal quarantine and include new areas. The several activities carried on under this item are briefly discussed in the following paragraphs:

Supervision of nurseries and greenhouses.-- The Japanese beetle occurs in the largest nursery sections of the United States. Nursery products produced in the infested area are shipped to every State in the Union. To prevent them from carrying the beetle to uninfested sections all those moving from the quarantined area must be handled or treated in a manner to eliminate risk of spreading the infestation. Products produced or handled as required by quarantine regulations and after prescribed inspection are certified and may move freely and without risk of carrying the pest into new sections. The requirements provided as a basis for certification vary with the class of nursery stock and the degree of infestation in or adjacent to the nursery or greenhouse in which it is produced. The adequate enforcement of these requirements forms the sole protection against the distribution of the Japanese beetle by these materials. Nursery stock is one agent by which the beetle may easily be transported into new sections. It is believed that this pest entered the United States in soil around the roots of nursery stock. If our uninfested regions are to be protected from infestation, it is important that adequate provision be made for inspection and certification of similar material moving to points outside the quarantined area. There are more than 1,600 nurseries in the regulated area and hundreds of thousands of plants are offered for shipment annually.

Scouting adjacent to nurseries and greenhouses.--- Nurseries and greenhouses in the quarantined area are classified on the basis of presence or absence of beetles on or adjacent to the individual premises. The requirements for certification of the two classes of establishments differ. A very essential part of the enforcement of quarantines for the protection of uninfested regions is the classification of these establishments, which can be determined only by scouting rather than by the use of traps. Inspection work of this type must be done with great care to avoid erroneous classification of establishments so as not to work undue hardship on the producer and at the same time give adequate safeguards against products that may move from their establishments.

Trapping to determine distribution.--- This work includes the operation of traps to determine the possible presence and relative abundance of the beetle. The traps are operated in selected localities where infestation is light and at places outside the known infested area, particularly along main highways or at important railroad centers. The information obtained from these operations is essential to the effective operation of the quarantine and protection from spread of the beetle. The prompt location of incipient outlying infestations can be accomplished only by this type of work, and any curtailment may delay location of centers of infestation for a number of seasons. Trapping operations begin in the Southern States early in June and at later dates in the more northern sections.

Trapping control.--- The operation of a large number of traps to aid in the reduction of beetles is an important part of control operations carried on at certain isolated centers of infestation.

Farm products inspection.--- Many types of farm products, particularly fruits and vegetables, may carry adults of the Japanese beetle into uninfested regions. Beans, apples, peaches, and berries are produced in considerable quantities in the infested area and are products which must be handled under

proper safeguard before they are shipped into the uninfested regions. The type of handling required prior to certification of various classes of products varies with the nature of the product. Various types of berries are fumigated and peaches are inspected, while beans are run through a mechanical device to shake off the beetles. Provision is also made that products inspected and certified be subsequently handled in a manner to prevent reinfestation. Products of this type are perishable and the force of inspectors must be adequate to handle them promptly and effectively so they can move in as nearly a normal manner as possible and still eliminate the risk of spreading the beetle.

Vehicular inspection.-- This work involves the maintaining of road stations on various highways leading from the quarantined area to assure that products likely to carry the beetle are being moved only in accordance with the requirements of the quarantine.

Transit inspection.-- Inspectors are stationed at certain important transportation centers within the infested area during part of the season to examine products regulated by the quarantine in order to assure that common carriers comply with the regulations of the Japanese beetle quarantine regarding the movement of products that may carry this pest.

Tests for the treatment of regulated products.-- This project provides for tests of various recommended treatments to determine their fitness or inadequacy under prevailing conditions as a basis of certifying products regulated under quarantine.

EMERGENCY FUNDS

Direct Allotments

Projects	Obligated, 1935
Loans and Relief in Stricken Agricultural Areas:	
Japanese beetle control	\$64,000

(d) MEXICAN FRUIT FLY CONTROL

Appropriation Act, 1936 \$140,460
 Budget Estimate, 1937 140,460

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Grove and packing-house inspection and certification	\$90,119	\$113,660	\$113,660
Spraying and control in Texas	8,028	16,800	16,800
Spraying and control in Mexico	4,650	5,000	5,000
Vehicular inspection	3,650	5,000	5,000
Total obligations	106,447	140,460	140,460
<u>Unobligated:</u>			
Legislative impoundments	80	- -	- -
Other amounts unobligated	730	- -	- -
Total	107,257	140,460	140,460

WORK DONE UNDER THIS APPROPRIATION

General.— The work carried on under this item is concerned with the protection of fruit-growing areas of the United States from the danger of infestation by the Mexican fruit fly. This insect has reached the American border in the Lower Rio Grande Valley in Texas. It is carried frequently and in large numbers to the border communities, particularly by shipments of infested fruit from points in Mexico, and spreads from these border towns to reinfest the citrus groves of southern Texas. It is the purpose of the Federal quarantine to prevent the spread of this insect to other fruit-growing areas, to eradicate the infestation in Texas, and to reduce the fruit-fly population as much as possible in the areas immediately adjacent in Mexico in order to lessen the danger of reinfestation from that source. In this effort good cooperation has been received from the local Mexican officials and from Mexican residents of Mexican border towns. However, commercial fruit raising is not practiced on the Mexican side at this point and hence such Mexican fruits as mangoes, etc., preferred fruit-fly hosts, are brought from interior points, and with them have come as many as 11,000 fruit-fly larvae in a single month.

During the past season infestation was found in a small area in Brooks County north of the area where infestation had previously been found. The Federal and State quarantines were modified to include this section, thus increasing the amount of work and the area to be covered. Three other important

fruit flies, common to Mexico, are occasionally found in fruit which reaches border towns, and specimens of these pests are collected in traps in Texas. The occurrence of these additional pests further emphasizes the need of vigorously continuing this work. The important activities are discussed in the following paragraphs:

Grove and packing-house inspection and certification.-- There are more than 8,000,000 citrus trees set out in grove formation in the Rio Grande Valley, and of this number more than 5,000,000 have already reached bearing age. Inspection of these groves during the season is necessary every thirty days to enforce the sanitary requirements on which certification of the fruit is based. These requirements provide for the picking-up and burial of all fallen fruit, the removal of weeds, etc. Packing houses are permitted to accept only fruit produced in groves which meet the sanitary requirements and are also required to dispose of waste products and culls in an approved manner. The period when fruit may remain on trees is restricted so a non-host period is enforced during the summer. Traps to aid in detecting possible presence of the fly are operated in the groves. This and other related activities form the basis of certification of fruit and give protection from spread of this important pest. The States outside the infested area depend on the Federal quarantine to prevent the movement of commodities which might be capable of carrying the Mexican fruit fly to fruit-growing sections outside the infested area. The work under this activity is of importance not only to the uninfested sections but also to the producers in the infested area, as it enables the fruit to be safely shipped to market.

Spraying and control in Texas.-- The use of traps to determine the presence or absence of the Mexican fruit fly has become of greatly increased importance due to the development of a new type of trap. When flies are detected in a grove it is sprayed with a poison spray made of nicotine sulphate. The proper application of this spray is essential, and it must be closely supervised. If maggots are found in the fruit, much of the fruit of the infested grove has to be destroyed.

Spraying and control in Mexico.-- Infestations of the Mexican fruit fly continue to be found across the line in Mexico in the vicinity of Matamoros. It is necessary that certain inspection and clean-up work be performed, all of which is done with the cooperation of the citizens of Mexico residing in the infested area. It will be necessary to continue this work in order to prevent the building up of infestations immediately adjacent to the American citrus cultures, which would be a constant menace to citrus production in the Rio Grande Valley.

Vehicular inspection.-- Control of the movement of fruit out of the quarantined area is greatly simplified due to the fact that there are but few avenues for traffic. Two railroads and two highways leave the Valley. The acceptance of fruit for transportation by common carriers is subject to control by the cooperation of the companies. The cooperation extended by railroads has been especially satisfactory and effective. Movement by trucks and in passenger cars is controlled by the operation of two road stations.

(e) CITRUS CANKER ERADICATION

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1936	\$13,485	\$113,120	\$126,605
Budget Estimate, 1937	<u>13,485</u>	<u>27,380</u>	<u>40,865</u>
Net change	<u>---</u>	<u>- 85,740</u>	<u>- 85,740</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Decrease
<u>Obligated:</u>				
Citrus-canker eradication				
(regular funds)	\$12,872	\$13,485	\$13,485	---
(emergency funds)	---	113,120	27,380	-\$85,740 (1)
Total obligations	12,872	126,605	40,865	- 85,740
<u>Unobligated:</u>				
Savings	167	---	---	---
Total	13,039	126,605	40,865	- 85,740 (1)

(1) The reduction of \$85,740 in the amount available for 1936 refers to an allotment from emergency funds. The amount of regular funds requested for 1937 is the same as the regular funds available for 1936. An allotment of \$140,500 from emergency relief funds has been made available for work connected with the eradication of this disease during the fiscal years 1936 and 1937. The planning and supervision of the work is conducted by regular employees paid from regular funds. These activities have given employment to more than 400 men and aided in eradication work in Louisiana and Texas.

WORK DONE UNDER THIS APPROPRIATION

Work carried on under this appropriation provides for the eradication of the bacterial disease of citrus known as citrus canker. These activities are now carried on in cooperation with the States of Louisiana and Texas. Through intensive inspection of nurseries and citrus groves an effort is made to locate and destroy all trees infected with this dreaded disease. As a result of the vigorous campaign which has been carried on against this disease in the past, it is practically eliminated from the important commercial citrus areas. It has been eliminated from Florida, Alabama, and Mississippi. Some isolated infections may, however, occur sporadically. The States that were infected are maintaining a close inspection of all citrus properties, and this should be continued. The infections have not been eliminated in Louisiana and Texas. No infection is known to occur in commercial properties in Louisiana, but in September 1934 and again during the past season infection has been found

in non-commercial trees. In Texas some thirty-one separate infections have been found during the last fiscal year in three counties. A few of these were in commercial properties and some in localities where no infection had previously been found.

Special work on this disease is now under way with an allotment from emergency relief funds, and an effort is being made to eliminate the source of all infections. This work is being conducted in Louisiana and Texas. It involves scouting to locate and destroy infections and includes the location and destruction of abandoned plantings which may be a source of infection. It also provides for elimination of wild citrus in or near areas where infection had been located, including the root stock in old groves. These old roots sprout at places where the disease may persist. The removal of these worthless trees is under State authority and with the approval, and in many cases, cooperation of the landowner.

Because of the extreme infectiousness of this disease, however, scattered infections may occur in dooryard plantings outside of commercial districts. It is necessary to follow up the work done in infected commercial properties and reinspect areas in non-commercial sections, even where trees have been removed, to see that all the shoots or sprouts have been eliminated or are free from infection. These centers of infection are a menace to citrus cultures, and continued inspection and eradication work are essential until the disease has been completely eliminated. The States are actively cooperating in these activities.

EMERGENCY FUNDS

Direct Allotment

Projects	Estimated obligations, 1936	Estimated obligations, 1937
Emergency Relief Appropriation Act of 1935:		
Citrus-canker eradication	\$113,120	\$27,380

(f) PHONY PEACH ERADICATION

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1936	\$49,828	\$666,488	\$716,316
Budget Estimate, 1937	49,828	165,080	214,908
Net Change	<u>---</u>	<u>-501,408</u>	<u>-501,408</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Decrease
<u>Obligated:</u>				
Phony peach eradication (regular).....	\$47,585	\$49,828	\$49,828	---
Control of phony peach disease (emergency).....	---	666,488	165,080	- 501,408 (1)
<u>Unobligated:</u>				
Savings	502	---	---	---
Total	48,087	716,316	214,908	- 501,408 (1)

(1) The decrease of \$501,408 refers only to allotment made from funds appropriated under "Emergency Relief Appropriation Act of 1935." No change is requested in the amount provided under the regular appropriation. An allotment of \$831,568 was made from Emergency Relief funds to provide for work which will aid in the control of the phony peach disease. A part of this amount (\$165,080) is allocated for work in the summer of 1936, in the early part of the fiscal year 1937. All these operations, which provide employment for some 1,400 men, are planned and directed by men employed under the regular funds. The work under the emergency funds has included the removal and destruction of infected trees, activities requiring the use of many laborers.

WORK DONE UNDER THIS APPROPRIATION

This appropriation provides for work on account of the phony peach disease by aiding the State inspection organizations in preventing the distribution of exposed nursery stock to uninfected regions and by scouting to locate infected trees in the vicinity of peach nurseries. This cooperation is carried on in the States where the disease has been found to occur and from which the principal shipments of susceptible nursery stock are made. The work also includes scouting in orchards to locate infected trees. The accurate determination of diseased trees requires special training and is one of the important phases of the eradication effort carried on with funds provided under this item. The phony peach disease is a serious infectious disease which makes peach orchards unprofitable by reducing both the size and the quality of the crop, and it has proved disastrous to peach growing where it has become established. Removal of diseased trees is the only known method of control. Local spread from tree to tree or from orchard to orchard is believed to be caused by an insect, the

peach borer, and long distance spread is believed to be caused through the shipment of nursery stock containing diseased trees which are set out in orchard form where they may then serve as new centers of infection.

In addition to infection in the States of Alabama, Florida, Georgia, Arkansas, Illinois, Oklahoma, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, Tennessee, and Texas, the disease has recently been found in Maryland, Virginia, and Kentucky. In many States these infections are scattering, the more heavily infected section being in Georgia. The work of eradication of this disease has been materially expanded with an allotment from emergency funds. It is anticipated that the work now under way will materially aid in protection from this disease and give added encouragement to the peach industry, especially in the Southern States. The continuation of the work under regular funds is necessary to cooperate with States to prevent the spread of the disease from infected areas; to continue scouting to determine possible new infected areas, especially in the Northern States; to continue the inspection of nurseries; and to follow up on the work done in the infected areas in the southern states.

EMERGENCY FUNDS

Direct Allotment

Projects	Estimated obligations, 1936	Estimated obligations, 1937
<u>Emergency Relief Appropriation Act of 1935:</u>		
Control of phony peach disease.....	\$666,488	\$165,080

(g) DATE SCALE CONTROL

Appropriation Act, 1936	\$24,856
Budget Estimate, 1937	---
Decrease	<u>24,856</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Decrease
<u>Obligated:</u>				
Date-scale control	\$23,922	\$24,856	---	-\$24,856 (1)
<u>Unobligated:</u>				
Savings	151	---	---	---
Total	24,073	24,856	---	- 24,856 (1)

(1) No estimate is submitted for control and prevention of spread of the date scale for 1937, and it is recommended that the language for this item be eliminated. No specimens of the Parlatoria date scale have been found in the area previously known to be infested for somewhat more than a year. Certain parts of the previously infested area are now believed to be entirely free of date scale. Intensive leaf-by-leaf inspection will have to be continued in certain areas throughout the present fiscal year before we can be assured that this pest has been eliminated in date-producing regions of the United States. If these inspections fail to disclose its presence and no unusual or unanticipated developments occur during the remainder of the present fiscal year, it is believed that the work on eradication of the date scale can be brought to a successful close and the appropriation for this purpose discontinued.

(h) FOREST INSECTS

Appropriation Act, 1936	\$160,015
Allotment to "Fruit and Vegetable	
Crops and Diseases," Bureau of Plant	
Industry (for work on Azalea flower	
blight)	- 600 (a)
Net available, 1936	159,415
Budget Estimate, 1937	187,835
Increase	<u>28,420</u>

(a) The foregoing allotment is carried forward by means of a transfer in the estimates for 1937.

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase
<u>Obligated:</u>				
Native forest insect investigations	\$91,059	\$94,812	\$117,232	+\$22,420 (1)
Introduced forest insect investigations	58,626	60,103	60,103	---
Shade-tree and hardy-shrub insects	4,100	4,100	10,100	+ 6,000 (2)
Insect relation to azalea blight	---	400	400	---
Total obligations	153,785	159,415	187,835	+ 28,420
<u>Unobligated:</u>				
Legislative impoundments	80	---	---	---
Other amounts unobligated	277	---	---	---
Total	154,142	159,415	187,835	+ 28,420

The increase of \$28,420 includes:

(1) An increase of \$22,420 for surveys of forested areas to locate possible infestations of the bark beetle and other major pests of forest trees before they have reached outbreak proportions, in order that appropriate control may be applied before the cost becomes excessive.

The Bureau of Entomology and Plant Quarantine is responsible for determining the status of infestations caused by insect pests and for recommending methods for control and means of preventing damage. The funds now available are not sufficient to enable the Bureau to advise and lead in conducting surveys to determine insect conditions in forests. Surveys conducted for the purpose of locating incipient infestations of bark beetles are the first and most important step in preventing the occurrence of outbreaks of these pests, which are annually causing excessive damage and loss of valuable forest trees in forest reservations and national parks and on private timber lands.

The Bureau has been cooperating with other agencies of the Government and private landowners by organizing or conducting surveys and furnishing the technical advice as to methods and measures for the control of outbreaks of native forest insects. Surveys conducted under this arrangement are for the most part made only in areas where the occurrence of important pests of forest trees have been observed by others and brought to the attention of the Bureau. Forest rangers and similar men in the National Park Service and the Bureau of Indian Affairs or cruisers for private timber owners are, as a part of their duties, on the lookout for damage caused by insect pests. When they have observed situations which appear to them important, these facts are brought to the attention of the Bureau and frequently are accompanied by a request that a survey be made of the area and recommendations submitted by the Bureau. This plan is a valuable aid in locating insect outbreaks and should be continued. It is, however, impracticable for these men to accurately and adequately locate incipient outbreaks. Furthermore, this program in effect tends to place the initial responsibility of determining insect conditions on agencies other than the one primarily responsible for this work.

The increase requested will provide for the employment of trained men whose business will be to locate insect pests without regard to other activities. It is well known that certain of the outbreaks of forest bark beetles which have caused excessive damage to our native forests have developed from small centers. Such centers of infestation may originate either on public or private lands and spread in all directions favorable to the pest. The prompt location of these incipient infestations and application of suitable control by public or private agencies should very greatly aid in preventing their spreading and causing excessive destruction. If the infestation is discovered when it is small, the cost incident to control would be less and, in addition to reducing control costs, protection would be given to timber which might otherwise be destroyed as the size of the outbreak increased. This modification of the plan followed for many years is fully justified, as the present program has failed to give needed protection in preventing insect enemies from destroying many native forest areas valuable for timber, scenic beauty, conservation of moisture, and the protection of watersheds.

(2) An increase of \$6,000 for work on insects attacking shade trees and hardy shrubs.

The funds now available are inadequate to provide for handling the requests for advice on means of control of insects affecting shade trees and ornamental shrubs. It has been conservatively estimated that there are more than 500,000,000 shade trees in the United States. It is impracticable to place a value on these trees, but if they are valued as low as \$10 per tree the investment would be five billion dollars. The increasing interest in home ownership and betterment and beautification of home conditions and sites has greatly increased the number of inquiries for information on the control of shade-tree pests. Additional stenographic assistance is greatly needed to handle this increasing mass of inquiries, and a part of the increase will be used for this purpose.

The developments in home plantings have added new problems in the control of insects attacking shade and ornamental trees. Pests not previously studied are attracting attention by the injury they do to new plantings, and information on these pests is badly needed. Methods for control which will not injure the tree are not now known for many kinds of mites, aphids, bark lice, and scale insects which feed on ornamental evergreens and similar plants. Pests of this nature are causing important losses and injury in many sections of the country, and there is also urgent need for the determination of methods of control that can be safely applied. A part of the increase will be used to employ an assistant entomologist to study these problems from headquarters at some established field station. Neither the Department nor State agencies are conducting investigations to secure the necessary information. Satisfactory recommendations cannot be given, and besides the loss of trees much time and money are wasted in the application of ineffective methods.

Azalea flower blight.-- An increase of \$1,000 was provided in 1936 under the item "Forest Insects" for investigations on flower blight of Azaleas. The cause of this trouble is not fully understood and methods for its control are not available. The disease is apparent for only a short period in the spring when the flowers are in bloom. Investigations on the disease come largely within the field of the Bureau of Plant Industry; however, problems concerned with its transmission by insects are in the field of the Bureau of Entomology and Plant Quarantine. The work has been conducted cooperatively, and the special funds which were made available have been used for investigations on both the disease and insect phases of the problem. More than half of the amount available (or \$600) has been allotted during the current year for work which comes within the field of the Bureau of Plant Industry, and it is proposed to carry this allotment forward by means of a transfer in the estimates for 1937.

WORK DONE UNDER THIS APPROPRIATION

General.-- This item provides for investigations on insects injurious to forests and forest products to determine methods of control of such pests and for planning and directing campaigns to control serious outbreaks that occur over large forested areas. Investigations to develop methods of control of insects attacking shade trees also come under this item. The activities are divided into the following project groups:

Native forest insect investigations.-- The work under this project is concerned with investigations on and the control of insects attacking forest trees and forest products. The work is carried on from seven field stations, located either at the regional headquarters maintained by the Forest Service of the Department or at their regional experiment stations.

An important part of the work involves investigations to develop or improve methods of control by the application of direct measures or through forest management. During the past three years several improvements have been effected which have resulted in reducing the cost of control of bark beetles in certain sections from 25 to 50 percent. It is believed that further studies will perfect methods which will make possible tremendous savings in the application of control measures. The use of oils which penetrate the bark may permit work throughout the dry summer season, and ways of applying insecticides from the air furnish a way for preventing losses by defoliators. Many forest insects cannot be controlled by direct methods and must be combated through forest management. Investigations on the white-pine weevil in the Harvard forest have demonstrated that sound silvicultural practices will insure control so that straight timber can be produced. Similar studies are under way in California and Oregon with the control of the Western pine beetle on yellow pine.

Enormous losses occur each year from insects which attack forest products in use. Many different kinds of insects, such as termites, powderpost beetles, various borers, etc., are responsible for these losses. Effective methods for the control of some of these have been devised and are recommended. Continued work is necessary to develop effective methods for other pests for which present measures are not fully applicable. The investigations on termites are of particular importance because of the emphasis placed on these pests and the many new controls that are being suggested.

The largest activity of this project is the cooperative control service, the backbone of the forest-insect control work done by various governmental agencies. The Bureau of Entomology and Plant Quarantine is responsible for recommending to the Forest Service, National Park Service, Bureau of Indian Affairs, and private timber owners when and where to conduct control investigations against important timber-destroying bark beetles or defoliators. To do this it is necessary to make extensive surveys of forests where abnormal insect activities are reported. The information secured from these surveys is used as a basis for recommendations to prepare estimates for the control work. As a practical aid to meet the urgent need of technical advice in carrying out various control programs, small amounts have been made available from funds for Emergency Conservation work. Because of the need for advice on problems of insect control in connection with the planting of the shelterbelt, certain funds were also placed at the disposal of the Bureau.

Introduced forest insect investigations.-- The work under this project deals with investigations on introduced pests of forest trees and is headquartered at laboratories at New Haven, Conn., and Morristown, N. J. It has as its two chief objectives (1) control of these introduced insects through the introduction and colonization and liberation of natural enemies; and (2) the development of effective sprays or dusts which may be used for artificial control. Certain problems being investigated are mentioned in the following paragraphs:

Special attention has been directed to insects which may have a relation to the Dutch elm disease. These studies have been carried on in the United States and Europe. They have been supported by regular funds supplied under this item, by \$6,000 transferred from the regular appropriation for the control of the disease, and by allotments from Emergency Conservation work. It has been determined that one species of introduced bark beetles transmits this disease from tree to tree. Information on the distribution and habits of this insect, particularly as to flight, methods of feeding, and the development of effective ways of controlling it are of immense importance to the effort to eradicate the Dutch elm disease. One native bark beetle is also known to transmit the disease, and information on it is also required. It is possible that a number of other native insects which attack elms may carry the disease from tree to tree. Investigations in this field have a very direct bearing on the eradication program. The need for information on insects that may transmit the Dutch elm disease has been so great that studies on certain problems have been suspended and adjustments made in other investigations to help provide for this emergency. A laboratory has been established at Morristown, New Jersey, in cooperation with the Bureau of Plant Industry, where these studies are conducted. In Europe two species of bark beetles are known to transmit the Dutch elm disease from tree to tree. One of these is established in the United States. The work in Europe is planned not only to supplement the studies conducted in the United States but also to determine whether other insects may transmit the disease in Europe, as well as the relation of the insect and the occurrence, spread, and control of the disease in localities where vigorous methods are not under way to eradicate it.

Shade-tree and hardy shrub insects.-- With funds now available the activities under this project are restricted to answering inquiries on insects attacking shade trees and hardy shrubs and suggesting means for their control.

Investigations on insect relation to Azalea blight.-- The flower blight of Azaleas is known to occur only in limited areas in the general vicinity of Charleston, South Carolina. There is some evidence to suggest that it may be transmitted from flower to flower by certain insects. The disease is evident only for a short time during the spring when the plants are in flower and the small allotment is used for studies during this period. The work is in cooperation with the Bureau of Plant Industry.

EMERGENCY FUNDS

(1) Direct Allotment

Projects	Obligated, 1935
<u>Loans and Relief in Stricken Agricultural Areas:</u>	
Transferred from Forest Service for a study of insects and their control in connection with the establishment of a shelterbelt in the Great Plains area	\$8,274

(2) Indirect Allotments

(Financed through other Government agencies)

Projects	Obligated, 1935	Estimated obligations, 1936
<u>Emergency Conservation Work</u> (authorized by Act of March 31, 1933; allotment through War Department):		
Control of insect enemies of forests	\$51,166	\$22,041

(i) GYPSY AND BROWN-TAIL MOTH CONTROL

	Regular	Emergency	Total
Appropriation, 1936	\$400,000	\$3,756,682	\$4,156,682
Budget estimate, 1937	400,000	---	400,000
Net change	---	-3,756,682	-3,756,682

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Decrease
<u>Obligated:</u>				
Inspection and certification (regular)	---	\$99,282	\$99,282	---
(emergency)	\$98,000	1,282	---	- 1,282 (1)
Gypsy and brown-tail moth control operations (regular)	---	300,718	300,718	---
(emergency)	350,000	3,755,400	---	-3,755,400 (1)
Total obligations:				
Regular funds	---	400,000	400,000	---
Emergency funds	448,000	3,756,682	---	-3,756,682 (1)
Total (all funds)	448,000	4,156,682	400,000	-3,756,682 (1)

(1) The Budget estimate provides for continuation of the regular control work on the gypsy and brown-tail moths and for the inspection and certification of products to meet the requirements of the Federal quarantine for these insects. The decrease of \$3,756,682 for 1937 is due entirely to discontinuance of work carried on under allotments from emergency funds, and includes:

(a) A decrease of \$1,282 in the project for inspection and certification, this amount being the unobligated balance, available in 1936, of funds assigned to this work from the allotment of Public Works funds which provided for operations on the gypsy and brown-tail moths during the fiscal year 1935.

(b) A decrease of \$3,755,400 in the project control operations for gypsy and brown-tail moths, the amount available from allotments of emergency funds as follows:

- (a) The unexpended balance of an allotment
from Public Works funds, for work in
fiscal year 1935 and available for 1936 \$17,400
- (b) The allotment from Emergency Relief
Appropriation Act of 1935, for con-
trol work on the gypsy moth..... 2,778,000
- (c) The allotment from Emergency Relief
Appropriation Act of 1935, for con-
trol work on the brown-tail moth..... 960,000
3,755,400

For the fiscal year 1935, the Federal work for the control and prevention of spread of the gypsy and brown-tail moths was financed solely from funds allotted by the Public Works Administration. The unobligated balance of this allotment, \$18,682, was continued available in 1936.

The regular appropriations for the fiscal year 1936 provided \$400,000 for the control and prevention of spread of the gypsy and brown-tail moths. These funds were for continuing the regular operations against these pests along the same general lines the work had been carried on for many years, i. e. (a) the inspection and certification of products to meet the requirements of the Federal quarantines, (b) maintenance of the barrier zone, and (c) eradication of the outlying infestations in Pennsylvania, New Jersey, and New York.

The two special allotments from funds appropriated under the "Emergency Relief Appropriation Act of 1935" provided for (1) the employment of some 4,000 men; (2) material enlargement of the control operations on the gypsy moth in (a) the barrier zone, (b) areas of outlying infestations, and (c) the area of infestation east of the barrier zone; and (3) the control of the brown-tail moth in the generally infested area. The control of the gypsy moth east of the barrier zone and the control of the brown-tail moth to which \$1,971,000 is allotted are activities additional to the usual operations to control these pests.

WORK DONE UNDER THIS APPROPRIATION

General.-- This item provides for the continuation of the regular control work on the gypsy and brown-tail moths and for the inspection and certification of products to meet the requirements of the Federal quarantines for these insects. The following activities are included:

Inspection and certification for gypsy and brown-tail moths.--- The work under this project deals with the inspection and certification of products originating in the quarantined area designated for shipment to points outside. The possibility of distribution of the gypsy moth over long distances on shipments of products which might carry it is illustrated by records on such shipments. Infestations have actually been discovered on and removed from shipments destined to practically every State in the Union. This inspection and certification covers commodities which are grouped into nursery, quarry, forest, and evergreen products. The certification is based on inspection, and these commodities thus inspected and certified are eligible for interstate transportation. Industries located within the infested area which deal with articles likely to carry this insect are enabled under Federal certification to ship their products in the normal way. If there were no Federal quarantine, State quarantines, which are practically embargoes, would be in effect in nearly every State. Interstate business in such articles would operate under a severe handicap in the face of such a system of State embargoes.

Control operations for gypsy and brown-tail moths.--- The work under this project is concerned with the control and extermination of infestations of the gypsy moth and brown-tail moth which are so located as to be susceptible to spread by natural means to points outside the infested area. This work is divided into "Scouting and extermination in the barrier zone" and "Scouting and extermination outside the barrier zone".

The barrier zone is an area some 20 to 30 miles in width extending from Long Island Sound on the south to the Dominion of Canada on the north. This strip of land extends over into New York State for its western boundary and into the New England States for its eastern boundary, the center of the zone being approximately the eastern New York State boundary line. Spread of moths by natural means from the generally infested area in New England into and through the barrier zone is controlled by the application of extermination measures in this zone. This requires scouting to locate infestations and their treatment to eliminate colonies which may be found.

The gypsy and brown-tail moths have been kept confined to the comparatively limited area comprising the New England States. Gypsy moth has been found on Long Island and in the Bronx, New York, northeastern Pennsylvania, and New Jersey. These are the only known infestations for either of these insects outside of New England. The infestation in New Jersey is small and is believed to be due to a colony which was not found and destroyed in the course of previous work there. The nature of the work in these outlying infestations is similar to that employed in the barrier zone, consisting of scouting to locate infestations followed by the application of suppressive measures with the object of complete extermination. The infestation in Pennsylvania was found in 1932, and the area involved has been increasing as scouting has progressed until now it takes in approximately 950 square miles. Cooperation of the States concerned is an important factor in the progress which has been made in dealing with these infestations.

Allotments totaling \$3,738,000 have been made available from emergency funds for the control of the gypsy and brown-tail moths. The supervision of this work is provided by the organization employed under the regular appropriation. Without this supervision the activities under the emergency funds could

not be carried out. The regular organization must be maintained to follow up the work when the relief program is discontinued.

EMERGENCY FUNDS

Direct Allotments

Projects	Obligated, 1935	Estimated obligations, 1936
<u>Public Works Allotments (National Industrial Recovery Act):</u>		
Inspection and certification	\$98,000	\$1,282
Gypsy and brown-tail moth control	350,000	17,400
Total, P. W. allotments (N. I. R.)	448,000	18,682
<u>Emergency Relief Appropriation Act of 1935:</u>		
Control and prevention of spread of brown-tail moth	---	960,000
Control and prevention of spread of gypsy moth ..	---	2,778,000
Total, Emergency Relief	---	3,738,000
Total, Emergency Funds (Direct Allotments)	448,000	3,756,682

(j) BLISTER RUST CONTROL

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1936....	\$250,000	\$3,183,850	\$3,433,850
Budget Estimate, 1937..	<u>250,000</u>	<u>3,164,385</u>	<u>3,414,385</u>
Net change.....	<u>- -</u>	<u>- 19,465</u>	<u>- 19,465</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Decrease
<u>Obligated:</u>				
Blister rust control operations:				
Eastern control program				
Regular funds	---	\$120,950	\$120,950	---
Emergency funds	\$569,230	1,591,925	1,582,190	-\$9,735
Western control program				
Regular funds	---	120,950	120,950	---
Emergency funds	569,233	1,591,925	1,582,195	- 9,730
Blister rust quarantine enforcement: .				
Regular funds	---	8,100	8,100	---
Emergency funds	7,725	---	---	---
Total obligations:				
Regular funds	---	250,000	250,000	---
Emergency funds	1,146,188	3,183,850	3,164,385	-19,465(1)
Total	1,146,188	3,433,850	3,414,385	-19,465

(1) The estimate of regular funds for 1937 is for the same amount as that appropriated for 1936. The decrease of \$19,465 is in emergency funds only.

The white-pine blister rust is one of the most important potential menaces to the production of white pine. It is important that this disease be controlled to protect the valuable white pine in the United States and to further the use of these trees in reforestation. An allotment of \$6,328,735 supplied from emergency relief funds, available for the fiscal years 1936 and 1937, is being used for extensive eradication work in both the western and eastern areas. The direction of the work under this allotment is provided for by this regular appropriation. The work under relief funds is expected to be continued during next season, and the supervision provided under regular funds is essential to the continuance of the program which gives employment to some 8,000 men. The

checking of this work is also essential and must be done by technically trained men. The amount recommended for 1937 is the minimum necessary for the intelligent direction and proper handling of the work.

WORK DONE UNDER THIS APPROPRIATION

General.-- Under this appropriation campaigns are conducted for the suppression and control of white-pine blister rust by cooperating with State organizations, counties, towns, and individual landowners and with the Forest Service, National Park Service, and Bureau of Indian Affairs in the eradication of Ribes (currants and gooseberries), which serve as carriers of the disease, as well as in the application of measures to delay the spread of the disease into uninfected regions.

The estimate of regular funds for 1937 does not provide for labor in removing Ribes. It is contemplated that this will be furnished by the co-operating agencies or by emergency funds for relief labor. In case more eradication work is carried out than can be supervised by these funds, it is expected that supervision will be supplied by the cooperators or from emergency funds.

This work provides for two main projects--one concerned with a control program and the other with the enforcement of the Federal quarantine on white-pine blister rust.

Blister rust control operations.-- The work under this project provides national leadership for the control of the white-pine blister rust and is carried on in cooperation with the appropriate agencies. For the purpose of convenience the discussion is divided into two sections based on the region in which the work is carried on.

In the eastern area the Department is cooperating in the control of blister rust through formal and informal arrangements with governmental agencies, States, counties, townships, individuals, and other local agencies in the control of white-pine blister rust in white-pine growing in the States of Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Jersey, New Hampshire, North Carolina, New York, Pennsylvania, Rhode Island, Vermont, Wisconsin, Maryland, Virginia, West Virginia, Ohio, Iowa, Illinois, Indiana, Tennessee, Kentucky, Georgia, and South Carolina. In this work the Department provides the leadership and coordination of the control activities and the States and their cooperators supply the supervision and labor. The work will include surveys to locate pines and areas where Ribes are growing; supervision of work for control done by cooperating States, counties, and towns, or with emergency funds available to the Bureau or other agencies for white-pine blister rust control; and checking eradication work to determine thoroughness.

The eastern control program must be continued (1) to assure the productivity of white-pine forests containing standing timber valued at over \$126,000,000; (2) to preserve regional scenic and recreational white-pine values of great economic importance; (3) to protect thousands of acres of young growth which will form the next timber crop; (4) to maintain control of

the disease on initially protected pine lands, aggregating 8,500,000 acres; (5) to apply control measures on the remaining unprotected pine acreage in the infected States; and (6) to extend protection to white pines in disease-free regions as rapidly as they are invaded by the natural spread of the disease. This is a national problem, requiring Federal leadership and technical knowledge to coordinate cooperating agencies.

In the western area, the control of white-pine blister rust is carried on in the States of California, Idaho, Montana, Oregon, Washington, Wyoming, and Colorado. In this area the Department assists cooperating State and local agencies in the application of control measures on State and privately-owned lands and furnishes leadership and technical assistance in coordinating control activities carried on in these areas by the Forest Service in protecting valuable white pines in national forests, and to the National Park Service and the Bureau of Indian Affairs in protecting valuable areas of white pines in national parks and on Indian reservations. The forested lands in this area are of mixed ownership, and control can be accomplished only by combining and coordinating efforts of all owners into a single program. The work under the regular funds will include surveys to locate pines and areas where Ribes grows; application of methods of eradicating Ribes plants; supervision of control work done in national forests and national parks and on private lands with funds supplied from other sources; and checking to determine the status of control work.

The blister-rust control program in the western United States must be continued (1) to assure the productivity of forest lands bearing Western white-pine and sugar-pine timber valued at \$288,000,000 and thus maintain industries dependent upon the white pine, which represents 50 percent of the business of the Western white-pine region, as well as valuable economic and business interests in the sugar-pine region of California; (2) to protect millions of acres of young growth that will form the next timber crop; (3) to prevent forced timber cutting and demoralization of the Nation's lumber markets; (4) to maintain control of the disease in areas already protected; (5) to apply control measures on the remaining unprotected areas; (6) to preserve scenic and recreational white-pine values of great economic importance; and (7) to extend protection to white pines in uninfested regions as rapidly as they are invaded by the natural spread of the rust.

Enforcement of quarantine on white-pine blister rust.--- The work under this activity is concerned with the enforcement of the Federal quarantine on account of white-pine blister rust. For the most part this work consists of (1) inspecting the premises and environs of nurseries in which pines susceptible to the disease are grown; (2) preventing the interstate shipment of rust-infected pines or currant and gooseberry plants likely to carry the disease and not meeting the requirements of the Federal quarantine; and (3) cooperating with nurseries, etc., in the protection of pine nursery stock against exposure to blister rust.

EMERGENCY FUNDS

Direct Allotments

Projects	Obligated, 1935	Estimated obligations, 1936	Estimated obligations, 1937
<u>Public Works Allotments (National Industrial Recovery Act):</u>			
White-pine blister rust control	\$1,146,188	\$19,500	---
<u>Emergency Relief Appropriation Act of 1935:</u>			
White-pine blister rust control	---	3,164,350	\$3,164,385
Total, Emergency Funds (Direct Allotments)	1,146,188	3,183,850	3,164,385

(k) DUTCH ELM DISEASE ERADICATION

	Regular	Emergency	Total
Appropriation, 1936 (a)	\$261,156	\$2,730,000	\$2,991,156
Budget estimate, 1937...	261,156	- -	261,156
Net change	--	-2,730,000	-2,730,000

(a) Of this amount, \$25,156 was obligated under immediately available authority in 1935.

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase or decrease
<u>Obligated:</u>				
Dutch elm disease eradication (regular).....	\$180,761	\$236,000	\$261,156	\$25,156
1936 appropriation obligated in 1935 (regular).....	-25,156	25,156	- -	-25,156
Dutch elm disease eradication (emergency funds).....	569,220	2,730,000	- -	-2,730,000(1)
Net total obligations:				
Regular funds	155,605	261,156	261,156	- -
Emergency funds	569,220	2,730,000	- -	-2,730,000(1)
<u>Unobligated:</u>				
Legislative impoundments.....	80	- -	- -	- -
Other amounts unobligated ...	778	- -	- -	- -
Total (all funds):				
Regular funds	156,463	261,156	261,156	- -
Emergency funds	569,220	2,730,000	- -	-2,730,000(1)
Total	725,683	2,991,156	261,156	-2,730,000(1)

(1) The estimate of regular funds for 1937 is the same as the amount appropriated in the Act for 1936. The decrease of \$2,730,000 is in emergency funds only.

An allotment of \$2,730,000 has been made available from emergency relief funds to continue the work on the eradication of the Dutch elm disease conducted during the first part of 1935 with appropriated and allocated funds in the amount of \$569,220. This new allotment was available during the latter part of the fiscal year 1935 and the fiscal year 1936 but will be expended early in the calendar year 1936. The operations under these emergency funds

are planned and directed by the personnel furnished with the regular appropriations.

The necessity for selected men on relief for work done with emergency funds retarded the scouting program necessary to determine the status of the disease, particularly the work in outlying areas. During the period when the foliage was on the trees it was impossible to scout in all sections where elm logs imported from Europe were shipped prior to the quarantine prohibiting entry. It was not possible to make the necessary number of inspections throughout the known infected area and in the surrounding sections. Available information regarding the status of this disease is, therefore, not entirely satisfactory. It is believed, however, that definite progress has been made towards its eradication and, if vigorous work can be continued, there is fair assurance of success which will protect trees in the general area of infection and prevent spread throughout the United States. The estimate here requested may be looked upon only as preliminary, subject to further developments.

The scouting work carried on so far this season has not disclosed the presence of infected trees in any new locality a considerable distance from the previously known infected area. Additional infected trees have been found at Norfolk, Virginia; Indianapolis, Indiana; Cleveland, Ohio; Old Lyme, Connecticut. A new infection has been found at Brunswick, Maryland, an important freight transfer center through which imported logs are moved. Some new infections have been found in localities comparatively close to the center of the infection in the vicinity of New York harbor. The known-infected area, therefore, centers around New York harbor and includes approximately 3,640 square miles in the States of New Jersey, New York, and Connecticut. The ten-mile protective area surrounding this center of infection includes approximately 2,185 additional square miles and extends to include approximately 40 square miles in Pennsylvania. During the past year, the major effort has been directed to the center of infection around New York harbor which covers approximately 5,825 square miles. The work consisted of scouting to locate diseased and dying elms, removal and destruction of infected trees, and conducting sanitary measures, including the removal and destruction of dead and dying trees which serve as breeding grounds for the disease and beetles which transmit it from tree to tree. These sanitary measures have also been carried out in the protective zone approximately ten miles wide, surrounding the known infected area. It is estimated that in this area of intensive operations there are more than 5,000,000 elms 15 feet in height used for shade trees. In addition, there are more than 5,000,000 elms over 15 feet in height growing in fields and woods and another 3,500,000 which are under 15 feet in height and over two inches in diameter. Through the swamps and woodlands there are many elms less than two inches in diameter, and including these would add 11,000,000 to the number of elms in the infected area. The total estimate of elms in the area of intensive operations is 24,500,000, and inspections have shown that more than 1,219,000 of these are dead and dying, forming ideal breeding places for the beetle which transmits the disease and giving abundant opportunity for further and rapid spread. The disease has been found in only 14,074 trees.

It has been definitely determined that at least two species of bark beetles which attack elms may transmit the disease from tree to tree. One of these is an introduced species which is well established through-



out the generally infected area and in some sections, particularly southeastern New England, where the infection has not yet been determined. The other beetle is a native species which is generally distributed throughout the eastern part of the United States. It has also been determined that under certain conditions, particularly in woodlots and swamps, the roots of many elms become grafted together and the disease may be transmitted from tree to tree through such root grafts. In situations where root grafting occurs it may be necessary to destroy all the elms. In certain areas the clean cut of all elms has been started. These facts may very materially increase the amount of work required should scouting disclose infection in any new area, and the amount of work incident to tree removal and sanitation would be increased proportionately.

State and local agencies in the generally infected area, as well as those in localities where isolated infected trees have been located, have contributed to the effort of eradicating the disease. In the generally infected area some States have contributed proportionately larger amounts of funds for the eradication work. For the years 1934 and 1935 the State of New York appropriated a total of \$322,500 for control and \$42,500 for research or a total of \$365,000. The State of New Jersey provided \$30,000 for the fiscal year ending June 30, 1935 and has appropriated \$50,000 for the current fiscal year on the condition that \$500,000 will be expended from Federal funds in that State.

WORK DONE UNDER THIS APPROPRIATION

This appropriation deals with the eradication of the Dutch elm disease in the United States and is used for activities concerned with its eradication and the enforcement of the domestic quarantine to prevent spread into uninfected regions. The activities consist of scouting to locate infected trees, identification of the disease in trees suspected to be infected, and cooperation with State and local agencies in the removal and destruction of infected trees and those which are potentially dangerous, for the coordination of the State work and supervision of the work carried on with emergency funds. The appropriation is not used for the removal and destruction of infected trees.

EMERGENCY FUNDS

Direct Allotments

Projects	Obligated, 1935	Estimated obligations, 1936
<u>Public Works Allotments</u> (<u>National Industrial Recovery</u> <u>Act</u>):		
Dutch elm disease eradica- tion	\$569,220	- - -
<u>Emergency Relief Appropriation</u> <u>Act of 1935</u> :		
Eradication of Dutch elm disease	- - -	\$2,730,000



(1) TRUCK CROP AND GARDEN INSECTS

Appropriation Act, 1936 \$361,418
 Budget Estimate, 1937 361,418

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Truck crop insect investigations....	\$166,094	\$171,881	\$171,881
Berry insect investigations.....	10,776	11,147	11,147
Sugar-beet insect investigations....	72,903	74,390	74,390
Tobacco insect investigations.....	29,926	63,900	63,900
Investigations of insects affecting greenhouse and ornamental plants..	38,886	40,100	40,100
Total obligations.....	318,585	361,418	361,418
<u>Unobligated:</u>			
Legislative impoundments.....	240	--	--
Other amounts unobligated.....	369	--	--
Total	319,194	361,418	361,418

WORK DONE UNDER THIS APPROPRIATION

General.--The work done under this appropriation deals with the study of insects and the development of means of control of the forms injurious to truck crops and garden plants, including vegetables, flowers, bulbous plants, potted ornamentals, and plants grown under glass, as well as such related crops as strawberries, raspberries, blackberries, sugar beets, and tobacco. It also provides for investigations on the European earwig, pest of mushrooms, and soil insects such as wireworms and white grubs attacking vegetables. Field laboratories are maintained in certain of the more important trucking regions and in localities where bulbs and other ornamental plants are produced.

Truck crop insect investigations.--The activities conducted under this project are concerned with insects affecting truck crops such as beans, peas, melons, potatoes, sweetpotatoes, onions, cabbage, etc. Investigations are now being conducted on the European earwig in the Pacific Northwest, cucumber beetles, pepper weevil, vegetable weevil, Puerto Rican mole cricket, pea aphid, sweetpotato weevil, celery leaf-tier, and various wireworms and white grubs injurious to truck crops. Certain phases of these investigations are conducted in cooperation with the Bureau of Plant Industry and the Bureau of Agricultural Engineering. The studies are carried on at seventeen field

laboratories located in various parts of the country. For the most part the investigations conducted at a laboratory cover a variety of problems and the laboratory may be considered as regional headquarters for work on truck-crop pests. For example, the pests of cole crops are studied at five different stations.

The development of satisfactory methods for the control of insects affecting vegetable and garden crops has assumed greater importance in recent years than at any time in the past. The development and expansion of the vegetable industry in the South and Southwest, the increased consumption of green food products, and the demand that these be free from insect damage and insecticidal residues are factors which have contributed to the increasing importance of this work. With the concentration of crops in certain areas old pests have increased in abundance and distribution. The pepper weevil, previously known in the country only in the West, has recently been discovered in parts of Florida. The tomato pinworm has been found in new areas and is causing heavy losses. Certain recently introduced pests, such as the Puerto Rican mole cricket and the vegetable weevil, are causing damage over larger areas. The mole cricket is proving to be an especially destructive pest in parts of the Atlantic coastal plain, where it injures seed beds by its habit of tunneling through the soft soil. No fully effective control is yet known; the baits suggested are only partly effective, and more work is necessary on the habits before the baits can be greatly improved. Many of these remedies which have been developed for the control of certain pests of truck crops involve the use of insecticides containing arsenic. Where heavy infestations occur the pests cannot be satisfactorily controlled without leaving excessive residues. This coupled with the careless use of insecticides by growers emphasizes the need for developing methods of control which will not leave harmful residues.

The activities under this project cover a wide variety of pests and crops. They affect not only the work of large industries, including canners and producing and marketing agencies of important food crops, but also practically all home gardeners. The interest in home gardens has been greatly expanded, and with it there is an increasing demand for information on the control of insect pests and an appreciation for the use of remedies which will not leave objectionable spray residues.

The requirement that canned vegetables be free from insect pests has emphasized the need of developing controls which will be highly efficient. Even if insects are present in such small numbers as to cause little visible damage, they may occur in sufficient number to cause rejection of the crop by the canner, with corresponding loss to the grower, or condemnation and seizure of the canned product. The development of the canning industry in the Pacific Northwest has brought demands for effective control measures for various pests, particularly certain insects attacking peas, a product receiving considerable attention.

Berry insect investigations.--The work under this project is concerned with the study of insects injurious to the small fruits known as berries and including strawberries, raspberries, blackberries, etc. Work is carried on at two field laboratories, one at Puyallup, Washington, for problems in the Pacific Northwest, and one at Chadbourn, North Carolina,

for problems in the strawberry sections of the eastern coastal plain. In the Pacific Northwest special attention is being given to development of measures to control the raspberry fruit worm and the raspberry mite. The work on these two pests is directed to the application of insecticides which do not leave objectionable residues and the method of applying them so they will be effective. Other important problems await study. Recently a European pest which attacks the ripe strawberry just beneath the cap has been causing damage in parts of the Pacific Northwest. The occurrence of large numbers of minute insects called thrips in cans of raspberries and related fruits produced in the Pacific Northwest emphasizes the need of studies to determine methods of controlling this pest, the occurrence of which has recently attracted particular attention.

At the Chadbourn laboratory in the eastern coastal plain special attention is being devoted to the control of the strawberry weevil and the strawberry root aphid. Work on the root aphid, which causes material losses and is apparently associated with one of the important strawberry diseases, is carried on in cooperation with the Bureau of Plant Industry. When the strawberry weevil occurs in such numbers that it cannot be controlled by cultural practices, it is necessary to apply insecticides. The present investigation is concerned largely with the use of derris and pyrethrum, which do not leave objectionable residues.

Sugar beet insect investigations.--This project is concerned almost entirely with investigations on the sugar-beet leafhopper, which is the most important pest of sugar beets in the western part of the United States and also damages vegetables. Its periodic attacks result in almost complete failure of beets, tomatoes, beans, and squashes in certain areas and cause marked reduction in the yields every year. The sugar-beet leafhopper transmits the destructive disease known as curly top. One insect may transmit the disease to a number of plants. The leafhoppers invade fields in large numbers in the migration periods and direct control in the fields has not been found practicable. The work on this insect in the different sections varies in scope and is divided into two work projects.

In the Intermountain Region the investigations are carried on from laboratories at Twin Falls, Idaho; Grand Junction, Colorado; Phoenix, Arizona; and Salt Lake City, Utah. It consists principally of surveys made to determine the abundance of the beet leafhopper and the availability of its favorite host plants in its natural breeding areas, studies to determine the value of sprays and trap crops, field studies and surveys to outline the main breeding areas, and modifications of these due to natural or artificial causes.

In California the studies are concerned with the determination of the value of spraying wild host plants and the elimination of breeding areas as a means of control, and the relation that populations of the leafhopper have to damage to tomatoes and other truck crops and the production of beet seed.

Tobacco insect investigations.--The work under this project is concerned with the study of insects injurious to tobacco both in the

field and in storage. It involves studies of the life history, habits, and methods of control by the use of insecticides, attractants, baits, fumigants, cultural practices, etc. The activities are divided into four work projects, three of which are closely related, as they are concerned with insects attacking tobacco in the field. The Agricultural Appropriation Act for 1936 provided an increase of \$33,000 for investigations on insects attacking tobacco in the field.

The work on insects attacking tobacco in the field is now carried on in three of the main areas which produce various types of tobacco. The work in the dark fire-cured area is located at Clarksville, Tennessee; that in the flue-cured area at Oxford, North Carolina, supplemented by seasonal work at Florence, South Carolina; and that on insects attacking shade grown tobacco at Quincy, Florida. Satisfactory controls that will not leave objectionable residues are not available for the control of many of the important pests, such as the hornworm and flea beetle. Concerns purchasing tobacco for manufacturing purposes are giving attention to the amount of visible residue that may occur. This emphasizes the need of the development of controls which will eliminate objectionable residues. In the dark fire-cured area tests are under way to determine the practicability of the use of poison-bait feeders as an aid in the control of the hornworm moth. Experiments to determine the effect of such insecticides as derris are also under way, as well as studies to determine the possibility of using pyrethrum or other organic compounds. The type of bait most effective for the control of the sod webworm is also receiving some attention. During the past season work in the flue-cured area has, for the most part, consisted of a survey to determine the abundance of the principal insect pests. Funds for work in this section did not become available until the active season was well advanced and it was not practical to start any intensive experiments for determining the value of various controls. Tests to determine the practicability of control by cultural practices, however, are now under way, as well as experiments to determine needed facts about the hibernation of important species. Surveys have been conducted to determine the status of the various insect pests, not only from the loss in the field but also the effect insect injury has on the price the farmer receives for his crop. These include not only the reduction because of visible injury but also the reduction due to loss in weight. In the shade-grown tobacco section the most important pest is the tobacco flea beetle. The practicability of using barium fluosilicate has been tested, and during the past season particular attention has been directed to the use of derris and cube dusts. Preliminary results indicate that it is practicable to control this insect, at least in seed beds, by the use of these materials. Attention is also being directed to methods of control of the tobacco thrips.

Investigations on insects affecting tobacco in storage which have been under way for a few years were undertaken in response to the demand of the tobacco trade of the United States. They are chiefly concerned with the development of methods of controlling the recently introduced tobacco moth and the tobacco beetle in both the closed and open type of warehouses. Some very useful and interesting information has been secured, and such conclusions as to control measures as have been developed have been made available to the trade. Aside from the protection of



tobacco produced within the United States, these investigations have a bearing on the production of a product sufficiently free from insects to meet the requirements of countries to which American tobacco is exported.

The infestation in closed storages can be materially reduced by the use of traps and fumigants. It is not practical to apply these methods in the open storages, and studies are being made to determine other measures of control such as the use of contact sprays. The practicability of using low temperatures is also being studied.

Investigations of insects affecting greenhouse and ornamental plants.--The work under this project deals with investigations to determine methods for controlling insects attacking flowering garden plants such as narcissus, tulip, dahlia, etc., and household and ornamental plants; insects injurious to flowers and all kinds of plants grown under glass; and insects injurious to mushrooms. There are many pests of these plants, and in many cases the control which may be used successfully on one kind of plant cannot be used on other kinds of plants. In determining controls for a given insect pest it is necessary to test them on most of the kinds of plants attacked and to study the control in relation to the culture of the plant. Some of the pests of greenhouse and ornamental plants now receiving special attention are (1) the cyclamen and broad mites--insects extremely difficult to control which, according to a conservative estimate, cause annual losses to greenhouse interests approximating one million dollars; (2) insect vectors of important mosaic diseases of rose and narcissus; it seems likely that certain of these diseases are transmitted by insects which may be fairly easily controlled; (3) the iris thrips, a widely distributed pest especially difficult to control where the tubers are left in permanent locations; (4) the Mexican mealybug--a pest attacking a large variety of plants, recently established in commercial greenhouses, which resists the treatments ordinarily used for the control of greenhouse insects; (5) the greenhouse red spider, a pest which attacks a wide variety of plants and causes losses throughout the country; (6) the gladiolus thrips--a limiting factor to the successful production of this favorite garden flower; (7) bulb mites; there are a number of mites which seriously injure narcissus bulbs and flowers for which satisfactory control measures are not available, and additional facts are needed before all varieties of bulbs can be disinfected to eliminate mites; (8) narcissus bulb flies; effective methods for disinfecting narcissus bulbs have been developed, but present methods of controlling the pest in the field are not fully effective.

The most important pest problems confronting the producers of mushrooms are maggots and mites. The control measures now available to the commercial producer are not fully effective. Conditions that must be maintained in the house for the satisfactory growth of mushrooms make it difficult to fumigate. Mite control is especially difficult because the fumigants ordinarily used do not penetrate the compost and reach the mite without injury to the mushroom. A sulphur burner has recently been devised which materially increases the opportunity for using sulphur in fumigating houses. Progress has also been made in the development of light traps. Further work, however, is necessary to make these results available to the producer. The chemical problems are being studied in cooperation with the Insecticide Unit.

EMERGENCY FUNDS

Direct Allotment

Projects	: Estimated obligations, 1936
<u>Emergency Relief Appropriation Act</u>	:
1935:	:
Construction of storage shed at	:
Chadbourn, North Carolina	: \$600

(m) CEREAL AND FORAGE INSECTS

Appropriation Act, 1936	\$347,229
Reappropriated by Second Deficiency Act, 1935, from 1935 appropriation for "Grasshopper Control" (to provide for a cooperative grasshopper survey)	25,000
Total available, 1936	372,229
Budget Estimate, 1937	372,229

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Cereal and forage insect investigations	\$217,125	\$257,614	\$257,614
European corn borer investigations.	79,462	82,468	82,468
Sugarcane and rice insect investigations	31,003	32,147	32,147
Total obligations	327,590	372,229	372,229
<u>Unobligated:</u>			
Legislative impoundments	240	- -	- -
Other amounts unobligated.	1,911	- -	- -
Total	329,741	372,229	372,229(1)

(1) The estimates for 1937 request the same amount as available for the fiscal year 1936. In comparison with appropriations there is, however, an apparent increase of \$25,000, as the Second Deficiency Appropriation Act, 1935, continued available and made a part of this item \$25,000 of the unexpended balance of the appropriation for "Grasshopper Control" to provide for cooperative surveys on grasshoppers. There was available for 1936 the sum of \$347,229 provided by the regular appropriation act and

\$25,000 referred to above, making a total of \$372,229, the amount requested for 1937, which includes provision for continuation of the grasshopper surveys.

WORK DONE UNDER THIS APPROPRIATION

General.--Investigations under this item are concerned with the development of effective and economical means of controlling insects affecting cereal and forage crops, including sugarcane and rice. The production of cereal and forage crops is the most important agricultural activity over a large part of the United States. The insects attacking these crops annually cause immense losses, and in some areas crops may be completely destroyed by these pests. Investigations on the European corn borer are also included under this item.

Cereal and forage insect investigations--The activities under this project are concerned with investigations to develop effective and economical means of controlling insects affecting corn, small grains (except rice), and forage crops. There are hundreds of kinds of insects which attack these crops. Some of these are injurious to both cereal and forage crops while certain others restrict their activities to certain types of crops. The work now under way is divided into many activities, which are briefly discussed in the following paragraphs:

The Hessian fly is the most important single insect pest of wheat. The amount of damage done each year varies with conditions. Surveys are conducted in cooperation with State agencies to determine the status of the pest and give timely information concerning control measures. Investigations are being conducted in cooperation with the Bureau of Plant Industry at certain State experiment stations to determine the varieties of wheat that are resistant to attack. An effort is being made to introduce certain parasites that occur in Europe and are not known to be established in the United States and to redistribute parasites already established in certain areas in sections where they do not now occur and may be of benefit. The work on the Hessian fly is carried on at Carlisle, Pennsylvania; La Fayette, Indiana; Manhattan and Wichita, Kansas; and Sacramento, California.

The Southwestern corn borer occurs in Arizona, New Mexico, and the western part of Texas. More recently it has been discovered as far north as Kansas and apparently is invading new areas in this general region. Investigations on the life history and habits of this pest have been largely completed, and the present studies aim to secure further information which is needed on methods for control under field conditions. Work is directed from the station at Tempe, Arizona.

Studies on chinch bugs are concerned primarily with the development of more effective measures to prevent the migration of the immature bugs from small grains to corn and of methods for determining chinch bug abundance, the effect of winter burning of grasslands, the value of trap crops near small grains, and the effect agronomic practices have on the abundance of the bugs. Work is headquartered at stations at La Fayette, Indiana, and Manhattan, Kansas.

The corn earworm is the most destructive generally-distributed insect enemy of corn in the United States and occurs throughout the country wherever corn is grown. No satisfactory control is known with respect to either field or sweet corn. Studies so far indicate that indirect methods may be useful in reducing the losses in field corn and that certain direct methods, such as the application of insecticides, may be effectively used for its control in sweet corn. Previous observations suggest that certain characters of the husk may offer partial immunity from attack. Studies are being made on varieties and strains to determine whether it would be practical to carry on intensive breeding to produce relatively non-susceptible varieties. Because of the importance of the corn earworm, additional emphasis has recently been placed on investigations of this pest. The work is now carried on at Arlington Farm, Virginia; La Fayette, Indiana; New Haven, Connecticut; and Webster Groves, Missouri.

The range caterpillar is a native insect occurring in considerable sections of the Southwest, being particularly abundant in New Mexico where it seriously reduces range grasses, resulting in heavy losses to sheep and cattle producers in that area. Studies to determine the effect of native parasites, particularly their colonization in large numbers, indicate this method of control would be unpractical in years of heavy outbreak. It may, however, be practical to use such natural controls to prevent the building up of heavy infestations. Studies are now under way to determine the relation of the caterpillars to climatic conditions and abundance of the parasites and to determine the effect of various climatic and vegetational factors on outbreaks. This work is headquartered at Tempe, Arizona, and much of the actual operation is carried on during the active season from a sub-station at Las Vegas, New Mexico.

There are many different kinds of insects which attack grasses and small grains. Some which have been studied during the past season are the black stem sawfly, the European wheat sawfly, joint worms, straw worms, etc. During the past two years the European wheat sawfly has occurred in outbreak numbers over considerable areas in Ohio and Pennsylvania. An effort is being made to colonize an introduced parasite which materially aids in the control of this pest in Europe and is now being established in parts of Canada. The work is headquartered at Carlisle, Pennsylvania, and Sacramento, California.

Sunflowers are an important crop in portions of Illinois, Missouri, and New Mexico and have been used as a substitute in cases of wheat failure, particularly in areas along the river bottoms. There are about five species of insects which are important pests of this plant. Sunflower seed has been made practically worthless for oil production because of severe insect infestations. The pressing of oil from sunflower seed has practically been discontinued in the Illinois and Missouri areas because of the heavy losses caused by insects. Studies are now under way to test methods of control under field conditions. This work is one of the problems being studied at the laboratory at Webster Groves, Missouri.

Insects may act as carriers of various diseases which are destructive to cereal and forage crops. Information on the relation of the insect to the disease is needed in developing control measures. At present particular attention is being directed to insect carriers of the Stewart's disease of corn.

It is indefinitely determined that at least two species of flea beetles transmit this disease and that certain other species of insects carry the disease over the winter. It is probable that these insects are the main source of carriers of the disease in the field. This work is carried on at the laboratory at Arlington, Virginia.

The alfalfa weevil is an introduced pest which has long been established in parts of the Western States. Studies on the alfalfa weevil are concerned principally with surveys to determine the spread and occurrence of this pest, to determine treatments that may be given to hay to eliminate the weevil, and to determine the effect of indirect methods of control such as proper timing of cuttings. This work is headquartered at Salt Lake City, Utah, and studies are also carried on at Medford, Oregon.

The alfalfa aphid causes severe losses in a number of the Middlewestern and Western States which produce alfalfa. Its abundance is somewhat periodic, particularly in the Pacific Northwest. Direct control by insecticides appears impracticable. Investigations during the last two years have developed certain strains of alfalfa which are highly resistant to aphid attack. The study of these and other strains is now under way with the cooperation of the Bureau of Plant Industry and State experiment stations. Certain fungi attack the alfalfa aphid, and work is being done to determine whether it is possible to utilize diseases in field control. The work is carried on at Forest Grove, Oregon; Manhattan, Kansas; and Sacramento, California.

The alfalfa seed chalcid is one of the important pests of alfalfa seed and infests the seed in the field. An effort is being made to determine why recommended methods of control are ineffective in certain localities in the West where this pest is important. These studies require a determination of the relation of grasses and other vegetation to the presence of the pest in fields where seed is produced. This work is headquartered at Tempe, Arizona.

There is a wide variety of insects which injure forage crops. The introduced hairy vetch bruchid, at present limited to the Central Atlantic States, has caused high losses in seed production, in some counties as much as 50 percent of the entire crop. Other such pests include the Western spotted cucumber beetle, an important enemy of alfalfa clover seedlings in the Pacific Northwest, and the various leafhoppers which attack alfalfa and often cause heavy losses in the yield and reduce the vitality of plants so that they are injured by winter killing. These studies are headquartered at Arlington, Virginia; Forest Grove, Oregon; and Carlisle, Pennsylvania.

There are many different species of grasshoppers that may occur in such abundance as to do excessive damage. When all the various kinds are abundant during the same season losses may be very great. Various species of grasshoppers differ in their habits, particularly as to associations favorable for egg-laying and the reaction to various baits. Studies are being made to determine more effective and economical baits, especially the development of those which may be substituted for the standard bran-mash now recommended. Emphasis is also placed on ecological factors influencing the abundance of the grasshoppers and the habits of the various economic species. These activities are carried on at the following stations: Bozeman, Montana; Forest Grove, Oregon; Sacramento, California; and Tempe, Arizona.

One of the most effective ways to prevent the building up of large outbreaks of grasshoppers such as occurred during the past few years is to locate centers of incipient infestations and apply control before the infestation builds up to outbreak proportions. To secure information of this nature surveys are carried on in cooperation with various State agencies. In this work the States contribute approximately half the cost. The information secured has in the past been used largely as the basis for planning control campaigns, and it should aid in preventing further outbreaks and serve as an insurance against the necessity of large appropriations for control. Cooperative survey work was made a part of the regular activities by the increase in the appropriation for the fiscal year 1936 authorized by the Second Deficiency Act for 1935.

The Mormon cricket has recently occurred in unusual abundance in certain sections in the Intermountain States. It has caused injury to range grasses and migrated from these range lands to farms in the mountain valleys. In combating these outbreaks the need for more effective and readily applicable methods for control was emphasized, as well as information as to the causes of outbreaks and the possibility of carrying on measures to prevent their occurrence. The Appropriation Act for 1936 provided an increase of \$7,500 for investigations on the Mormon cricket, the Act indicating that an amount not to exceed \$15,000 was to be available for this purpose. With this increase studies are now under way to improve direct methods of control.

White grubs are an important pest of sod lands and cereal crops. Serious damage has occurred over considerable areas in the North Central States region in the past few years, and there have been heavy losses in many isolated sections throughout the United States. There are many native species of white grubs. The life history of various forms differs. Some species complete their life cycle in one year while others may extend it for two, three, or four years. Methods now available for the control of white grubs are unsatisfactory. In an effort to develop more effective controls the work on these pests has been expanded, and investigations are now under way in the laboratory at La Fayette, Indiana, and Madison, Wisconsin.

Cutworms, the larvae of various native moths, cause material losses to a variety of crops. Studies are being carried on in the laboratory at Manhattan, Kansas, to determine the possibility of avoiding infestations by the method of handling the land during the period when eggs are being laid. Observations are made at various other places throughout the country to determine the flight period of various moths of species known to be of economic importance.

Many of the common pests of cereal and forage crops are attacked by fungous diseases. Comparatively little is known regarding these diseases or conditions under which they may become abundant. Investigations are conducted in the laboratory at Forest Grove, Oregon, to determine the possibility of using diseases as an aid in control.

Insects which attack stored grain and various products, especially flour, cause annual losses amounting to many million dollars. Investigations on insects attacking stored grain are headquartered at Manhattan, Kansas. The activities are carried on in the main milling centers in the vicinity of Kansas City, Missouri, and Minneapolis, Minnesota. Studies are directed to securing accurate information regarding more effective control methods, determining the effect of various dosages of fumigants used, devising methods of control without the use of fumigants or other direct agents, determining the practicability of using vacuum as an aid in eliminating infestation on mill products, etc.

Effort is made to import natural enemies which may aid in the control of various pests of cereal and forage crops. At the present time special attention is being given to the importation of parasites of the Hessian fly and the European wheat sawfly. An effort is also being made to locate parasites of the hairy vetch bruchid and the alfalfa snout beetle, both of which are introduced pests which are attracting considerable attention. The latter is known to occur only in the general vicinity of Oswego, New York.

European corn borer investigations.--Work under this project is concerned with the entomological phases of investigations on the European corn borer. Its objectives are the origination and perfection of effective and economical methods to control the pest and surveys to secure facts as to its status. The survey of 1934 showed that, although climatic factors over much of the infested area had been unfavorable for the development of the borer and it had not spread to any extent to the West, it had materially increased along the Atlantic coast from Connecticut south to the eastern shore of Virginia. There was severe injury to sweet corn in the New England area, especially in Connecticut and Rhode Island. Losses to field corn have been localized and confined largely to parts of Ohio and New York. The survey for the present season shows that the borer has increased over most of its known range and caused severe injury in sections where it was not destructive last year. It is significant that it has increased materially in certain parts of the one general area remote from the lakes and where it was not previously abundant. This indicates there may be material spread to the West and South. The spread into new areas along the eastern coast is also important. There has been no long distance spread, although it has been found in new sections along the border of the known infested area.

Special attention is now being given to determine methods of controlling the insect in sweet corn by the use of insecticides, and good progress has been made in developing formulae which may be made available to growers. Work on varieties of corn resistant or tolerant to the borer is conducted largely at Toledo, Ohio, and one character of resistance in field corn has been definitely determined. This is being developed in strains, about 140 of which are being studied to select for fixation in varieties suitable for commercial use. Mechanical measures and cultural practices for control are being studied in order to perfect simpler methods and devices which may be used throughout the infested area. The colonization and introduction of parasites is directed largely to the establishment of these natural aids in areas where they do not now

occur, especially in western Massachusetts, Connecticut, Long Island, New Jersey, and the newly infested sections of Maryland and Virginia. Surveys to determine general distribution, abundance, and status are continuing and form an important part of the work having a bearing on research and control activities.

Sugarcane and rice insect investigations.---The work carried on under this project is concerned with investigations on insects attacking sugarcane and rice. Headquarters for this project are maintained at Houma, Jeanerette, and Crowley, Louisiana; Beaumont, Texas; and Everglades, Florida. Special attention is now being given to the following activities:

The sugarcane moth borer annually causes very excessive losses to cane in the United States, reducing the yield by boring in harvested cane and injuring the stand by attacking seed cane. Studies are now under way to determine the susceptibility of different varieties of cane to moth infestation and to determine characters responsible for resistance and attractiveness. Indications are that certain varieties with hard rind are less attractive and less susceptible to attack. Information regarding these varietal differences may offer a measure of protection from the cane borer. Studies on this insect also include the possibility of utilization of an egg parasite as a means of control. Studies by investigators in other countries indicate that this egg parasite is effective in the control of the cane borer, and observations by some investigators in the United States tend to confirm this opinion. Experiments conducted by the Bureau do not fully substantiate these conclusions. Work on this egg parasite may be completed in another season and attention directed to other parasites which have been introduced from South America and the introduction and colonization in Florida of others which have been especially effective in certain islands of the West Indian group.

Certain insects transmit various diseases of cane, particularly the mosaic disease which is an important limiting factor in the production of cane in Louisiana. The recent discovery of two other species of aphids which carry certain of the mosaic diseases may offer an explanation of the variation in the severity of these diseases on different plantations and locations. The determination of further information about these vectors and their relation to native grass hosts, particularly those attacked by mosaic diseases, and the effect of attending ants on the abundance of aphids need further study. Studies on the insect vectors of these diseases are being carried on in cooperation with the Bureau of Plant Industry.

Among the other insects attacking sugarcane are the sugarcane beetle, which also attacks rice and often causes material losses to both crops, and the sugarcane mealybug, wireworms, and the lesser cornstalk borer. Investigations to determine methods of controlling these pests by artificial and cultural means are under way.



A condition known as "pecky" rice causes excessive annual losses which during the year 1931 were estimated at \$700,000 and in 1932 at \$350,000. This condition is the result of feeding by various species of insects on the rice in the field, the results of which are evident on harvested and stored grain. Investigations to determine methods of controlling the insects responsible for this damage are under way. Studies are also being made of the rice stalk borer and of insects which attack the crop in the field and remain with the harvested rice to do further damage in mills and warehouses.

Until recently practically no work had been done on the control of various pests of rice in storage. Experiments have been begun in a limited way to determine the effect of various fumigants and the dosage required to control some of the commoner pests in rice mills and in warehouses where rough and cleaned rice is stored.

(n) EUROPEAN CORN BORER CONTROL

Appropriation Act 1936 \$32,939
Budget Estimate, 1937 32,939

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Inspection and certification of products regulated by quarantines on the European corn borer	\$31,893	\$32,939	\$32,939
Total obligations	31,893	32,939	32,939
<u>Unobligated:</u>			
Savings	181	- - -	- - -
Total	32,074	32,939	32,939

WORK DONE UNDER THIS APPROPRIATION

This appropriation provides for the certification of products originating in the infested areas to meet the requirements of State quarantines on account of the European corn borer. To secure protection from the artificial spread of the corn borer, following the removal of the

Federal quarantine, many States issued quarantines prohibiting or regulating the entry of products that may carry the borer from the infested area. Certain products may be safely moved after adequate inspection. To provide for this inspection and certification the Bureau is cooperating with various States and certifying such products going to States maintaining corn-borer quarantines and which do not recognize State certification. There is no reason to anticipate that any such adjustments will lead to fewer demands for certification.

EMERGENCY FUNDS

An allotment of \$116,000 from funds provided by the "Emergency Relief Appropriation Act of 1935" has been used during the past season to make a survey to determine the distribution and abundance of the European corn borer. The facts secured as a result of this survey are used to aid in the certification work in the areas where this work is of value. The corn borer has not invaded much new territory, and there can be only minor modifications as to areas infested and requirements imposed by various State quarantines.

Direct Allotment of Emergency Funds

	:	Estimated
Projects	:	obligations,
	:	1936
<hr/>		
	:	
<u>Emergency Relief Appropriation Act of 1935</u>	:	
European corn borer survey	:	\$116,000

(o) BARBERRY ERADICATION

	Regular	Emergency	Total
Appropriation, 1936	\$200,000	\$1,199,460	\$1,399,460
Budget Estimate, 1937	200,000	1,179,460	1,379,460
Net change		- 20,000	- 20,000

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Decrease
Obligated:				
Eradication of the barberry in the 13 States where work was begun in 1918 (regular)	- - -	\$193,100	\$193,100	- - -
(emergency)	\$279,047	960,561	945,008	-\$15,553
Eradication of the barberry in other States (regular)	- - -	5,400	5,400	- - -
(emergency)	85,480	238,899	234,452	- 4,447
Inspection of nurseries which ship barberries interstate (regular)	- - -	1,500	1,500	- - -
Total obligations:				
Regular funds	- - -	200,000	200,000	- - -
Emergency funds	364,527	1,199,460	1,179,460	- 20,000(1)
Total	364,527	1,399,460	1,379,460	- 20,000

(1) The regular estimate for 1937 is for the same amount as that appropriated for 1936. The decrease of \$20,000 is in emergency funds only.

During the past two years the work of destroying barberry plants has been materially increased by special allotments of emergency funds available for relief. All these activities have been and are being directed with the trained regularly-employed personnel and without them could not be undertaken. An allotment from emergency funds for relief of \$2,730,000 is being directed by the organization, and the regular funds requested will be used largely for directing and supervising this work, which provides employment for some 1,800 men. This allotment is available for work during the fiscal year 1936 (season of 1935) and 1937 (season of 1936). A small portion of the regular funds will be used for necessary checking of work done, the coordination of work with local agencies, and directing appropriate educational campaigns.

WORK DONE UNDER THIS APPROPRIATION

Funds available under this appropriation provide for cooperation with States, individuals, and other agencies in the eradication of the common barberry, the intermediate host of the black stem rust fungus. The purpose of this work is to control black stem rust of wheat, oats, barley, and rye and prevent the occurrence of epidemics of this disease. This work consists of locating and removing bushes of those species or varieties of barberry which serve as intermediate hosts of the fungus. Federal funds are used largely for the supervision and coordination of the work of State and local agencies which supply labor and inspectors and share in the expenses of scouting. Barberries may resprout from portions of roots left in the ground or be produced from seeds which have lain dormant on the ground for some time. It is therefore essential that the areas be reinspected to insure that the plants have been eliminated.

The work of eradicating rust-susceptible barberries was begun in 1918 in the following thirteen States: Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming. Recently the same type of cooperative work has been undertaken in Missouri, Pennsylvania, Virginia, and West Virginia. The work in these sections gives needed protection to local wheat-producing sections which in certain localities is of prime importance from a food standpoint and is largely in the nature of campaigns for local control. That done in certain sections also gives protection to the main wheat crop. This is especially the case in Missouri, where the work is centered in counties adjoining the Illinois and Iowa State lines.

A Federal quarantine prohibiting and regulating the movement of barberry plants is enforced, and a small part of this appropriation is used for the inspection of nurseries which ship barberry plants interstate. Certain varieties of barberry are immune to the disease and under appropriate inspection and certification can move without risk. The movement of rust-susceptible varieties is prohibited.

The benefit from the eradication of barberry in wheat areas is well recognized and farmers, farm organizations, milling and railroad interests, and farm-machinery groups support and endorse the work. State, local, and other agencies cooperate and support it.

There has been a steady reduction in the general damage from stem rust since the beginning of the campaign. The past season, however, witnessed the worst epidemic since 1916. This outbreak differed from that of 1916 in many features, and everything points to the conclusion that the reduction in numbers of barberry plants in the area where it occurred lessened its severity. The outbreak of the past season was strictly a wheat epidemic and occurred only in the Plains spring-wheat growing area of eastern South Dakota, western Minnesota, and the Red River Valley of North Dakota. In 1916 the outbreak was general and came directly to wheat from the overwintering form of rust on barberry. In the section where the outbreak of the past season occurred wheat was anywhere from ten days to three weeks late in maturing, due to the unusual weather conditions following the drought.

In the southern edge of the spring-wheat area these abnormal conditions permitted the development of infestation which spread northward. Abnormal conditions of this nature may possibly occur again. The elimination of the barberry and prevention of the overwintering spores of rust going directly from it to small grains will, however, continue to give protection from general and annual losses throughout the main areas where wheat and small grains are produced.

EMERGENCY FUNDS

Direct Allotments

Projects	Obligated, 1935	Estimated obligations, 1936	Estimated obligations, 1937
<u>Public Works Allotments (National Industrial Recovery Act):</u>			
Control of black stem rust of wheat, oats, barley, and rye	\$364,527	\$20,000	- -
<u>Emergency Relief Appropriation Act of 1935:</u>			
Barberry eradication	- -	1,179,460	\$1,179,460
Total, Emergency Funds (Direct Allotments)	364,527	1,199,460	1,179,460

(p) COTTON INSECTS

Appropriation Act 1936\$147,244
Budget Estimate 1937, 147,244

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Cotton Boll Weevil investigations	\$52,752	\$54,404	\$54,404
Investigations of miscellaneous cotton insects	49,768	52,125	52,125
Thurberia Weevil investigations	9,518	9,965	9,965
Pink Bollworm investigations.....	29,856	30,750	30,750
Total obligations	141,894	147,244	147,244
<u>Unobligated:</u>			
Legislative impoundments	80	- - -	- - -
Other amounts unobligated.....	1,292	- - -	- - -
Total	143,266	147,244	147,244

WORK DONE UNDER THIS APPROPRIATION

General.---The funds provided under this appropriation are used for investigations on insects attacking cotton plants and crude cotton products and for the development or improvement of direct or indirect methods of control. Comparatively few States are engaged in the investigation of insects attacking cotton. Practically all the investigations conducted in the United States for the control of insect pests of this important crop are, therefore, provided for under this item.

Cotton boll-weevil investigations.---The funds allotted to this project provide for studies on the boll weevil, the most important cotton pest in the South, and the development and improvement of control measures. The scope of studies under way covers a wide field. Some of the more important lines of work are:

Field tests on new and promising insecticides or combinations of insecticides. Under certain conditions the use of calcium arsenate to control the cotton boll weevil creates a situation favorable to the development of native cotton pests, such as the cotton aphid. Studies under way provide for modifying applications or adding other insecticides to each application so as to eliminate this difficulty. The details for the control of the boll weevil differ in various parts of the cotton belt, and accurate information is not available for certain sections as to the most effective time to apply the recommended methods to secure effective control. The studies also include tests to determine whether it is most practicable to reduce the amount of calcium arsenate in the earlier applications, or to eliminate the calcium arsenate applications and use the molasses-calcium arsenate mixtures instead or to substitute sulphur or other non-arsenicals. The work is conducted from laboratories in South Carolina, Mississippi, and Louisiana.

Cage tests are being made to determine the toxicity of new insecticides or new combinations of those tested in comparison with the standard calcium arsenate and the effect that these materials or combinations may have on the cotton plant. These cage tests are used as the basis for field tests.

In certain areas, particularly those along the Atlantic coastal plain, calcium arsenate and other arsenicals appear to have a deleterious effect on certain types of soil. Studies are in progress to determine the effect that insecticides used for control of the boll weevil have on cotton, forage, or truck crops that may later be planted in these soils.

Certain native parasites are known to attack the boll weevil, and studies are being made in cooperation with various States to determine their seasonal and geographical distribution and abundance and to ascertain the relation they may have to other insects and environmental factors. These studies are for the purpose of determining whether it would be practicable to utilize these natural agencies in control. In certain sections natural enemies contribute to reducing the weevil to such an extent that artificial control is seldom required. An effort is being made to determine the reasons for their effectiveness in these areas.

Studies are also conducted to determine the characters of the cotton plant which make certain varieties resistant to the boll weevil. The early development of tough carpel lining and the pilosity of the bolls seem to be characters which affect their suitability for oviposition by the weevil. Some seventeen varieties have been under observation, five of which were studied closely. This work is carried on in cooperation with the Bureau of Plant Industry at five experiment stations in Mississippi and two in Louisiana, with main headquarters at Stoneville, Mississippi.

The boll weevil is apparently largely restricted to cotton but it will attack certain other malvaceous plants. Studies are under way to determine how important these varieties may be as hosts.

Investigations of miscellaneous cotton insects.--Work under this project includes studies on the distribution, life history, and habits of many insect pests which occur rather widely throughout the cotton belt and the development of control measures for those which are particularly injurious. In some sections various native insects are more important as pests of cotton than is the boll weevil, and in all parts of the main cotton belt their control has to be considered and timed in connection with that applied for other pests. Some of the problems now receiving special attention are discussed below.

The cotton flea hopper and closely allied insects which cause the cotton plant to shed squares are very important pests and often cause extensive damage over wide areas. In the coastal plain section of Texas the cotton flea hopper is the most important cotton pest. Investigations to determine methods of control by the use of insecticides and by cultural practices are under way. These studies are centered at Port Lavaca, Texas.

The cotton bollworm causes considerable damage to cotton and in many parts of the western section of the main cotton belt is considered the most destructive cotton insect pest. Studies to determine the relation of this pest to environmental factors, the effectiveness of insecticides or repellents to the moth, and the possible value of natural enemies are in progress. Its control by insecticides is difficult because they must be applied before the worms enter the bolls. Much of this work is carried on from the laboratory at College Station, Texas, and is done in cooperation with the Texas Agricultural Experiment Station.

Various root aphids are pests of considerable importance in the eastern part of the cotton belt, particularly along the Atlantic Coastal Plain. Studies for control by cultural practices and insecticides are being carried on at Florence in cooperation with the South Carolina Experiment Station. There are at least three species involved, and the host habits, particularly the relation to certain weeds and grasses, have an important bearing on control.

Preliminary investigations indicate that Fusarium wilt of cotton may be disseminated by insects which occur commonly in cotton fields. Studies to determine the part such insects may play in spreading these diseases are being carried on in cooperation with the Texas Agricultural Experiment Station.

At least six different species of true bugs injure cotton, especially in regions where it is produced under irrigation. These pests cause shedding of squares and young bolls and stain the lint, thus materially lowering its quality. Studies are being made to determine the relation of these bugs to their native host plants and the practicability of controlling the insects by the use of insecticides or cultural means. Much of this work is carried on in Arizona, with field headquarters at Tucson.

Comparatively little is known about the various soil-inhabiting insects which injure cotton. There are many different kinds, some of which cause considerable injury in certain localities. A study is under way to determine the species involved in various types of soils and to find methods for control in sections where this is required.

Some of the native insect pests of cotton, such as the red spider, cotton stainers, the leaf perforator, crickets, and flea beetles occur in outbreak numbers periodically and cause important losses over considerable areas. Effective means of controlling many of these are not known. Studies are in progress to determine the life history and habits of these various pests, and experiments to determine how they can be controlled are being carried out in the various field laboratories, particularly those at Tallulah, Louisiana, and Florence, South Carolina.

Thurberia weevil investigations.--This project provides for investigations on the life history, habits, and development of control measures for the Thurberia weevil, the western form of the cotton boll weevil, which is confined to the limited portions of the cotton-growing area of southeastern Arizona and parts of Mexico. This insect is a dry-land form of the cotton boll weevil and has as its native host wild Thurberia cotton, which is generally distributed throughout the mountainous regions of the Southwest. This weevil has adapted itself to cotton and is a potential enemy to cotton production in the arid regions. Its habits differ from those of the boll weevil, and in limited areas around Tucson it has demonstrated that it can do material damage to cultivated cotton. Present studies are concerned with its distribution and its adaptation to cultivated cotton and to the development of control measures by the use of insecticides.

Under an allotment of \$167,474 from emergency funds, relief labor is being used to locate and destroy Thurberia plants in areas where the weevil occurs. It is important that surveys be made to determine the effect this work has on infestations of the weevil on both Thurberia and cotton.

Pink bollworm investigations.--The activities under this project are concerned with investigations on the pink bollworm to develop needed facts regarding its life history and habits and to improve and develop new control measures which may be used in combating the insect in the limited sections of the United States where it has become established. These investigations will also serve as an insurance by providing additional information regarding means of controlling or eradicating this pest should

it become established in new areas. The work is carried on in cooperation with the Texas Agricultural Experiment Station and the Mexican Department of Agriculture. Headquarters are maintained at Presidio, Texas, and Tlahualilo, Durango, Mexico. Special attention is now being directed toward:

Breeding and colonization of introduced parasites. Four parasites have been introduced from Egypt and two from Hawaii. These are being bred in the laboratory at Presidio and colonized in the heavily infested sections along the Mexican border in both the United States and Mexico. The more promising of these parasites have only recently been received and the work with them is just getting under way. Incidental studies on native parasites are also carried on as part of this activity.

The use of insecticides. This work is being studied in the laboratory and in the field to determine the toxicity of various materials and the possibility of applying them under field conditions to reduce or control this pest.

Studies on control by cultural means, which are under way in cooperation with the Bureau of Agricultural Engineering. This work includes experiments to determine the effect of plowing and irrigation on the overwintering larvae and to develop machinery which can be used in cleaning the field of crop remnants.

Observations on the life history and habits, which are being made to determine needed additional facts, including the effect of various conditions on survival and hibernation.

Studies abroad to determine parasites which may aid in control. Collections of promising parasites are being made in Egypt and Hawaii for introduction into the United States.

EMERGENCY FUNDS

Direct Allotment

Projects	:	Estimated obli-
	:	gations, 1936
<u>Emergency Relief Appropriation</u>	:	
<u>Act of 1935:</u>	:	
Construction of portable insectaries at Tallulah, La.	:	\$2,000
Construction of field insectaries at Presidio, Texas.....	:	4,900
Construction of field insectaries at College Station, Texas	:	2,000
Total	:	8,900

(q) PINK BOLLWORM CONTROL

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1936	\$276,839	\$91,200	\$368,039
Budget Estimate 1937	<u>276,839</u>	<u>- - -</u>	<u>276,839</u>
Net change	<u>- - -</u>	<u>-91,200</u>	<u>-91,200</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Decrease
<u>Obligated:</u>				
Supervision of sterilization of cotton or cotton products required by Federal quarantine (regular funds)	\$84,134	\$87,039	\$87,039	- -
Scouting within regulated area to determine status of pink bollworm (regular funds).....	29,055	30,000	30,000	- -
Scouting outside regulated area to determine presence of pink bollworm (regular funds).....	64,097	66,400	66,400	- -
Cleanup operation to aid in control of pink bollworm in Big Bend of Texas (regular funds)...	14,550	15,000	15,000	- -
Vehicular inspection to determine compliance with quarantine on pink bollworm (regular funds)...	4,850	5,000	5,000	- -
Eradication of wild cotton in Florida for protection against infestation of pink bollworm:				
Regular funds	70,994	73,400	73,400	- -
Emergency funds	- -	91,200	- -	-\$91,200(1)
Total obligations:				
Regular funds	267,680	276,839	276,839	- -
Emergency funds	- -	91,200	- -	- -
Total	267,680	368,039	276,839	-91,200
<u>Unobligated:</u>				
Legislative impoundments (regular funds)	160	- -	- -	- -
Other amounts unobligated (regular funds).....	894	- -	- -	- -
Total (all funds):				
Regular	268,734	276,839	276,839	---
Emergency	- -	91,200	- -	-91,200(1)
Total	268,734	368,039	276,839	-91,200(1)

(1) The regular estimate for 1937 is for the same amount as that appropriated for 1936. The decrease of \$91,200 is in emergency funds only, covering the eradication of wild cotton in Florida. During the present season the work of eradicating wild cotton from the southern part of Florida, especially on the Keys and islands, has been enlarged by an allotment under the Emergency Relief Appropriation Act of 1935, giving employment during the period when this work can be carried on to an average of 1,400 men. This enlargement of this work should aid in attaining the objective. The wild cotton sprouts readily from root fragments that may be overlooked and seeds that have matured germinate.

WORK DONE UNDER THIS APPROPRIATION

This item provides for eradication, control, and regulatory work on the pink bollworm. The activities are concerned with the prevention of spread from the infested area, including the enforcement of quarantine measures; control operations in the area along the Mexican border contiguous to the infested area in Mexico; eradication activities in isolated points of infestation in Florida and Georgia; scouting to determine presence of the worm in uninfested sections; eradication of wild cotton in Florida; and other related work to protect the cotton culture of the United States from this pest.

The pink bollworm is one of the most destructive pests of cotton and is generally established in all important cotton countries except the United States. It occurs only in limited areas in this country but is a potential menace to cotton culture over most of the United States. Infestations have been eradicated from large areas in Texas, Louisiana, and Arizona. It is believed that extermination of the insect throughout the infested area is possible except for those sections adjacent to sources of infestation in Mexico. Operations to combat it continue in the States of Arizona, Florida, Georgia, New Mexico, and Texas.

The quarantine requirements in various parts of the regulated area differ in some details, depending on conditions of infestation. In all areas the seed is sterilized and its handling at oil mills, etc., regulated. In sections where the infestation is heavy the lint has to be fumigated and compressed before it can be shipped. All the gins, oil mills, and compress and fumigating plants in the infested area have to be supervised to see that they comply with necessary safeguards. All cotton products which may leave the regulated areas have to be certified. These operations are closely associated with the marketing of the crop, and the work must be handled in an effective manner to give required protection and adequate provision made for the orderly handling of the crop.

There is need for careful and thorough inspection within the regulated areas to determine conditions of infestation. The regulations enforced differ between lightly and heavily infested areas, and the determination as to this degree of infestation can best be made by gin-trash machines. Their use cannot be replaced by any other form of inspection with equal efficiency and economy. The cost to producers of compliance with the regulations in the sterilization of seed and lint is directly affected by the information obtained from the use of these machines within the regulated area.

The development of machines capable of segregating gin trash, leaving the larvae of the pink bollworm readily exposed to view in an almost negligible quantity of trash, has brought this type of inspection to a point which justifies its consideration as an item altogether separate from that of scouting, although it is an essential part of the scouting work. These machines have been improved from year to year and are now mounted on trucks, which enables them to be moved readily from one location to another. Since it is not necessary to tear down and set up the equipment, machines may be moved from gin to gin or locality to locality under their own power as circumstances may require, and the efficiency of the work is thus greatly increased. The use of these machines at gins in and out of the regulated area furnishes a more comprehensive knowledge of pink-bollworm conditions throughout the entire cotton belt. The gin-trash machine furnishes the most positive evidence with respect to the presence or absence of the pink bollworm in a given locality. It is this inspection on which greatest reliance is placed for the finding of infestations of the pink bollworm before they have time to become thoroughly established and spread over considerable areas.

The laboratory inspection and gin-trash inspection are supplemented by a third method for determining the presence or absence of the pink bollworm. This third method consists of field inspection. It is used in areas outside the regulated area where some reason exists for suspecting the possibility of infestation and where it is important to discover this infestation at the earliest possible moment and where the infestation must be traced to definite fields of growing cotton.

The heavily infested section is in the vicinity of Presidio, Texas. Cotton heavily infested with the pink bollworm in Mexico is separated only by a little more than the width of the Rio Grande from growing cotton in the United States, infestation being heavy on both sides of the river. A general program of suppression and control is maintained in this area on the American side of the border. This includes field cleanup and other operations to reduce the infestation and the hazard of spread because of the occurrence of large numbers of moths and worms. In the adjacent area in Mexico agricultural officials and growers are watching the progress of the work across the river and good cooperation is being received, there being a rather general and concerted attempt to follow the cleanup procedure.

The danger of spread by the movement of seed and lint by truck or similar means from the heavily infested section in the Big Bend section of Texas is markedly greater than from the lightly infested sections. To prevent such movement road stations are operated in cooperation with the State on the important roads leaving the heavily infested section.

In southern Florida, where a very heavy infestation has been found in wild cotton, the program has consisted of removal of this wild cotton. At the outset, that most accessible to the average resident or tourist was removed first, gradually working back to more remote locations. Experience has shown that some of this cotton will sprout from portions of the roots which were not removed, and it also comes from seed. This necessitates going over the ground again and probably several times. Additional territory will be included in this season's work, and it is believed that most of the wild cotton has been located. Work on the removal and destruction

of wild cotton can be done only during the drier seasons. The activities for the coming season will be materially increased by an allotment of \$91,200 from emergency funds for the employment of some 1,400 relief workers. It is anticipated that this will aid in the progress of this work.

EMERGENCY FUNDS

Direct Allotment

Projects	Estimated obligations, 1936
<u>Emergency Relief Appropriation Act of 1935:</u>	
For eradication of wild cotton in Florida for protection against infestation of pink bollworm.....	\$91,200

(r) THURBERIA WEEVIL CONTROL

Appropriation Act, 1936.....\$2,808
 Budget Estimate, 1937.....2,808

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Enforcement of Thurberia weevil quarantine.....	\$2,632	\$2,808	\$2,808
Total obligations.....	2,632	2,808	2,808
<u>Unobligated:</u>			
Savings.....	92	- - -	- - -
Total.....	2,724	2,808	2,808

WORK DONE UNDER THIS APPROPRIATION

The work done under this appropriation provides for the administration and enforcement of the Thurberia weevil quarantine, which involves supervision of the movement and, in some instances, the treatment of cotton, cotton-seed, and other articles likely to carry the Thurberia weevil into uninfested regions. The Thurberia weevil is a native variety of the Mexican boll weevil and occurs in limited areas in the State of Arizona. Under natural conditions this native insect lives on wild Thurberia cotton. With the production of cultivated cotton in this area it became attracted to this

crop. The weevil has demonstrated capacity to breed in cultivated cotton and, because of its ability to live under dry conditions, is a serious menace to cotton grown in semi-arid regions. The expenditures for the enforcement of the quarantine are of a continuing nature and are the minimum required to meet conditions.

An allotment of \$167,474 under the Emergency Relief Appropriation Act of 1935 is being used to employ men to locate and destroy wild *Thurberia* plants in parts of the area where the weevil is known to occur. This work has a bearing on the activities conducted under this item, as the removal of *Thurberia* plants in the infested area may reduce the possibilities of infestation in commercial cotton. The work being done as a relief project under emergency funds will not, however, permit any immediate modifications in the quarantine requirements to safeguard the spread of the *Thurberia* weevil.

EMERGENCY FUNDS

Direct Allotment

Projects	Estimated obligations, 1936
<u>Emergency Relief Appropriation Act of 1935:</u>	
Locating and destroying <i>Thurberia</i> plants.....	\$167,474

(s) BEE CULTURE

Appropriation Act, 1936	\$68,000
Budget Estimate, 1937.....	<u>75,500</u>
Increase.....	<u><u>7,500</u></u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase
<u>Obligated:</u>				
Bee culture and apiary management.....	\$47,278	\$68,000	\$75,500	+\$7,500 (1)
<u>Unobligated:</u>				
Other amounts unobligated....	1,092	- - -	- - -	- - -
Total.....	48,370	68,000	75,500	+ 7,500 (1)

(1) An increase of \$7,500 for investigations to develop more effective means of combating the disease known as American foulbrood. American foulbrood is a highly contagious disease effecting the larvae of honeybees. If

not detected and properly attended to promptly, the entire apiary may become infected, and eventually all the bees in the apiary will be killed. It may be carried from one part of the country to another by the transportation of contaminated beekeeping equipment or transmitted from one apiary to another by robber bees. It is widely spread throughout the United States and under normal conditions apparently takes an annual toll of approximately five per cent of all the colonies. Practically all States have laws regarding apiary inspection and considerable money is expended in their enforcement. It is conservatively estimated that during the past ten years the cost of such enforcement has exceeded \$3,000,000. During recent years inspections have been as extensive and thorough, and in many localities the disease has increased. The importance of the disease has thus been emphasized, accompanied by an insistent demand that efforts be made to control it. These requests also include demands of almost equal weight that additional investigations be made to determine more effective ways of preventing the losses occasioned by the disease.

The only effective means now known of controlling the disease is to burn colonies where infection is found. The disease, however, may lie dormant for several years, and lightly infected colonies are easily overlooked. The burning of colonies in which the disease is evident may not eliminate it from an apiary, so this method is not fully effective. Besides, burning of the infected colonies involves not only a loss of the bees but also the beekeeping equipment.

A different and somewhat related disease of the larvae of bees known as the European foulbrood is rather effectively controlled by the use of a strain of bees resistant to the disease. By using a resistant strain of bees beekeepers rarely suffer losses from European foulbrood. It is believed that it would be practicable to develop a strain of bees resistant to American foulbrood. It is not to be expected that investigations of this type can be completed in one season. The opportunity for success in this field is greatly increased because of recent developments in methods of controlling the mating queen bees. Should such investigations develop a strain of bees resistant to American foulbrood, it would save millions of dollars to State and local agencies now expended in the enforcement of regulations, and savings to the beekeeping industry would be greatly in excess of this amount.

WORK DONE UNDER THIS APPROPRIATION

The work carried on under this item is concerned with investigations on the habits and management of bees to make the production of honey and wax more profitable and to facilitate the pollination of fruits and vegetables and forage crops by the use of honeybees. This is the only item in the appropriation made by the Federal Government which provides assistance or aid to the beekeeping interests in the United States, the annual value of which is conservatively estimated at \$100,000,000. Only fourteen States carry on investigations in bee culture. They look to the United States Department of Agriculture to supply them the necessary information regarding the management of bees, control of their diseases, and satisfactory and effective methods of handling them in the pollination of plants and production of honey and wax.

The headquarters for this project are at Beltsville, Maryland, where the work is administered and investigations are conducted. This laboratory also studies bee problems affecting the Eastern States. Field laboratories are located at Laramie, Wyoming; Baton Rouge, Louisiana; and Davis, California, to investigate problems peculiar to their region and also study the effect of regional conditions on problems occurring throughout the United States.

Diseased bees or samples of broods from diseased colonies are sent from all parts of the United States to the Beltsville laboratory for diagnosis. This work is of a service nature and is essential to the beekeeping interests of the United States. The laboratory also issues permits authorizing the importation of live bees into the United States and examines all shipments to see that they are free from disease and meet the requirements of the law governing the importation of living bees and the regulations promulgated thereunder. The investigations on bee diseases are conducted at Beltsville and Laramie and include studies on the life history of the various diseases, especially European foulbrood and para-foulbrood, recently discovered in several Southeastern States; the resistance of various strains to European foulbrood; beeswax as a possible medium for the spread of disease; and the relation of the location of infection to sources of infectious honey.

Studies are under way at the laboratories at Baton Rouge, Louisiana, and Beltsville, Maryland, to develop improved strains of bees, attention being directed primarily to producing bees which have greater longevity and greater honey-carrying capacity; bees with longer tongues so they will be more effective in the fertilization of plants, such as clover; and bees which will be more hardy in northern climates and strains which will be active under adverse weather conditions.

In cooperation with the Bureau of Agricultural Economics and the economic divisions of State experiment stations and agricultural colleges, investigations are under way to secure the necessary information regarding the economic aspects of the beekeeping industry in the Pacific Coast States. The work in California is carried on in cooperation with the economists of the Giannini Foundation, and that in Oregon is carried on in cooperation with the State Agricultural Experiment Station. A survey of 225 beekeepers in California showed that during 1933, 84 percent produced honey at a loss and that the average cost of producing honey was 6.9 cents per pound, while the average price received was 5.4 cents per pound.

Studies are under way to determine the regions producing the most satisfactory honey flora and the time when honey plants are available from the standpoint of honey production. Studies to determine the types of honey produced by various plants are also under way. A limited amount of work is being done to determine the value of honeybees in pollinating certain deciduous fruits. The effect of certain poisonous plants and their relation to beekeeping is also being studied.

The shipment of bees in two and three pound packages with queens is a relatively new and rapidly growing industry. Such shipments permit the prompt establishment in Northern States of vigorous colonies at a time when they are most needed for the pollination of various fruit trees. It also permits the strengthening of colonies which have become weakened due to

adverse weather conditions occurring through many areas during the winter. Considerable loss has occurred in the shipment of the bees, with consequent litigation between the shippers and the express companies. Investigations are now in progress to determine the best methods of handling colonies to develop satisfactory shipping containers and food that may be used in transit, as well as methods of caring for the packages at destination or at transfer points.

In connection with the shipment of package bees, as well as in the usual methods of handling the colonies, the queen bee may become unacceptable to the hive and either be driven out or a new queen developed. This is generally known as supersedure, and its occurrence in connection with colonies shipped into new areas very greatly reduces the value of the colony. The causes of this phenomenon are little understood. Special studies are being made to determine the facts, with a view to suggesting possible methods of correction. The work is being carried on at Baton Rouge, Louisiana, Laramie, Wyoming, and at northern points where package bees may be shipped. Preliminary information has been secured but further work is needed.

Limited attention is given to a number of other problems to develop at least preliminary data needed in relation to the work on other activities. One of these has to do with bee flight habits, another with colony population, and still another with the effect of a reserve supply of pollen. Studies on beeswax are also carried on in cooperation with the University of California.

(t) INSECTS AFFECTING MAN AND ANIMALS

Appropriation Act, 1936.....	\$120,148
Budget Estimate, 1937.....	<u>150,148</u>
Increase.....	<u>30,000</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase
<u>Obligated:</u>				
Insects affecting man, Investigations of.....	\$42,813	\$44,123	\$44,123	- - -
Household insects, investi- gations of.....	13,960	14,475	14,475	- - -
Insects affecting animals, investigations of.....	61,258	58,550	88,550	+\$30,000 (1)
Insects affecting poultry and wildlife, investi- gations of.....	2,896	3,000	3,000	- - -
Total obligations.....	120,927	120,148	150,148	+ 30,000 (1)
<u>Unobligated:</u>				
Legislative impoundments..	80	- - -	- - -	- - -
Other amounts unobligated.	183	- - -	- - -	- - -
Total.....	121,190	120,148	150,148	+ 30,000 (1)

(1) An increase of \$30,000 for continuation of research work on screw worms conducted in the present fiscal year under the special appropriation for screw worm control.

The Agricultural Appropriation Act for 1936 provides that \$480,000 be immediately available for work on screw worms. Of this amount \$55,000 was allocated for investigations to determine facts regarding the screw worm in the Southeast and to investigate measures for its control under these new conditions. These studies have been under way during one season and some interesting facts obtained. It is unlikely, however, that conclusive results on many of the problems will be secured with only one year's experimentation. Means and equipment for carrying on these studies have been provided through the special appropriation. To determine the accuracy of the preliminary results and secure full benefit from them it is important that funds be made available for continuing these investigations.

It is believed that very material benefits have accrued from the co-operative educational campaign, and the livestock owners and others have been advised on control measures. Effort has been made to make this educational work thorough and extensive. It is likely, however, that there will be cases where additional advice will be sought and needed during the summer of 1936. It is important, therefore, that at least a small group of specialists be available in the Southeast to render such service. Much advice of this kind could be given by the investigators incident to and in connection with the prosecution of these research activities.

WORK DONE UNDER THIS APPROPRIATION

General.--The activities under this item comprise investigations on insect pests attacking man or injuring him by carrying diseases, including those insect pests which annoy man in his habitation or destroy household supplies, fabrics, etc. This item also provides for investigations on insect pests of farm and range animals, poultry, birds, and wild birds and animals and the development of methods for their control or eradication. Activities are carried on independently or in cooperation with the Public Health Service and Bureau of Animal Industry and Biological Survey of the Department of Agriculture. The Bureau of Entomology and Plant Quarantine is, however, responsible for the investigations on insects.

Insects affecting man, Investigations of.--The work under this project is concerned with investigations of insects which annoy man by direct attack or injure him by carrying diseases. Only a few of the more pressing problems are now being studied. The most important of them are discussed below.

Mosquitoes as a class constitute the greatest insect pest known to man. They are responsible for carrying such diseases as yellow fever, malarial fever, dengue fever, etc. There are many different kinds of mosquitoes, and no one control measure is equally effective for all kinds. The habits of some of the commoner forms are fairly well known and means of control have been developed. The habits of many kinds are known only in a general way, and effective controls are not available. Even with the commoner forms methods of control depend on various local conditions. Planning for control campaigns requires technical assistance and at present the requests for advice can only be partially met. The studies under way are con-

ducted from Portland, Oreg., Savannah, Ga., Orlando, Fla., and Washington, D.C. Those in the Northwest are concerned largely with forms in flood water and those in Georgia and Florida with salt-marsh forms, although in Florida attention is also being given to the group of mosquitoes which obtains its air through plants rather than coming to the surface of the water. The work done from Washington has special relation to the transmission of equine encephalomyelitis by mosquitoes.

Sand flies do not carry diseases. However, they are of prime importance to man in certain sections of the country, particularly along the Southeast seaboard. Investigations under way are headquartered at Savannah, Georgia, although some studies are also made in Florida. The habits of only a comparatively few species of sand flies are known and for some of them no effective control measures are now available. It is, however, now possible to suggest control measures that will materially reduce the numbers of certain species. The value of these methods should be further tested and a way devised to combat those living in trees and to determine the effect of pumping out diked areas.

Eye gnats transmit a dangerous eye disease, especially common among children of school age, and are particularly troublesome in parts of the Southern States and in certain sections of California. Recent investigations in California have developed means for partial effective control measures for that locality and work there has been suspended. Investigations now under way are conducted in the winter-garden area of Texas where a severe condition exists and in localities in the Southern States.

The larvae of certain blowflies are used by surgeons to clean out and heal certain types of wounds, particularly bone lesions. In this work it is essential that they have available a constant supply of sterile maggots. The development of safe and economical methods of rearing and transplanting these maggots has been investigated and ways of safe handling developed. It has been found that excretions from the maggots may have a beneficial effect and these are now being studied.

Certain ticks, including the common dog tick, transmit Rocky Mountain spotted fever. Studies are being made to determine the habits of these ticks and methods for their control. These include the investigation of repellants that may protect man from attack.

Household insects, Investigations of.---The activities falling under this project are concerned with insect pests in dwellings, hotels, etc., those annoying householders, and those destroying household supplies, drugs, fabrics, etc. There are many kinds of insects which annoy man or destroy his household possessions. The habits of these differ greatly. The habits of the same species may even differ under various conditions of artificial environment. The development of control measures is complicated because of the wide variety of conditions under which the pests occur. Special attention is now being given to the development of more effective methods of control by fumigation, the use of safe fumigants, and the determination of conditions under which various fumigant materials may be used. These studies also involve determining the effect that proposed controls may have on the products in storage, households, stores, etc. During the past year work on insects affecting books and public documents has received special attention

in connection with the storing of these records in the Archives Building. Cooperative work to determine the effect of fumigants for control on the paper, etc., has been conducted with the Bureau of Standards.

Insects affecting animals, Investigations of.--The work under this project is concerned with the development of methods for the control of insects injurious to horses, cattle, sheep, goats, swine, and other domestic animals, as well as game animals.

Screw worms are pests of cattle, sheep, goats, and various other animals, causing immense losses, particularly under range conditions. The studies conducted with allotments from regular funds were carried on at field laboratories in Texas and directed toward the development of controls under conditions occurring in the range country of the Southwest. About 90 percent of the screw-worm infestations are caused by the species recently defined, which restricts its breeding to live animals. The habits of this species are different from those of the composite species and should be studied in detail and more effective controls developed.

The larvae of certain flies, commonly known as cattle grubs, not only greatly injure hides but materially interfere with the effective management of dairy and range cattle. The annual losses from these insects are estimated at as high as \$50,000,000. Studies are being made of methods for controlling these pests. The practicability of using materials containing rotenone is receiving special attention and holds considerable promise.

The larvae of certain flies commonly called horse bots cause material injury to horses and related animals and also greatly reduce their efficiency. These losses are much more serious than previously supposed. Recent investigations have developed new facts regarding the life history of these pests which will apparently have important relation to control operations. More complete information on the habits of these pests and methods of preventing infestation are particularly needed.

The sheep head bot materially lowers the vitality of the infested animal and in many cases causes its death. Goat lice do a great amount of injury to the hair, particularly mohair, and also reduce the vitality of the animals. The losses caused by these pests to sheep and goat raisers are great, and there is an insistent demand for effective control measures. Experiments to determine the value of certain volatile materials and sulphur are being carried out, but the effect of these possible treatments on the animals and insects needs further study.

A small allotment is used for work on the buffalo gnat. The work consists chiefly of securing data regarding outbreaks and incidental tests on repellents that may be useful.

In 1931 the factory value of fly spray was over \$9,000,000, according to an estimate of the Bureau of the Census. The production of these sprays has increased greatly since that time. Many of those now used on farms to protect livestock, particularly dairy cattle, are valueless and even detrimental to cattle and dairy and other food products. Investigations are now under way to develop a more effective and cheaper spray. If successful, this work will be of material aid to the livestock and dairy industry and, besides controlling flies, will tend to reduce the opportunity for disease.

A number of species of ticks are detrimental to animals. Wounds to cattle caused by some ticks, such as the common ear tick, provide entrance places for other pests such as screw worms. Information on the distribution and habits of these species is not well known and no satisfactory control measures are available for several important species.

Insects affecting poultry and wildlife, Investigations of.--The work done under this project deals with investigations on insect pests and mites which attack poultry and wildlife for the purpose of developing means of controlling them. These pests levy a heavy toll on poultry owners in spite of methods of control already developed. The amount of these losses and their distribution over the entire country justify the effort to continue to develop control measures to supplement those now recommended. Only a few problems are being studied at the present time. During the year some attention was given to the effect the fire ant has on the nesting habits of game birds in the South and cooperative control work observed. The work is headquartered at Beltsville, Maryland.

(u) INSECT PEST SURVEY AND IDENTIFICATION

Appropriation Act, 1936.....\$134,798
Budget Estimate, 1937 134,798

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Identification and classification of insects.....	\$113,104	\$120,239	\$120,239
Insect pest survey.....	9,119	9,559	9,559
Exchange of beneficial insects.....	5,014	5,000	5,000
Bioclimatics and relation to insects.....	2,500	- - -	- - -
Total obligations.....	129,737	134,798	134,798
<u>Unobligated:</u>			
Savings.....	114	- - -	- - -
Total.....	129,851	134,798	134,798

WORK DONE UNDER THIS APPROPRIATION

General.--The work carried on under this item is essential to the various activities of the Bureau and involves the identification of specimens; the assembling and recording of facts regarding the distribution and abundance of economic insect pests; and the coordination and direction of the work incident to the introduction, exchange, and distribution of natural enemies which may aid in the control of injurious insect pests.

Identification and classification of insects.--The work under this project is of a continuing and service nature of vital importance to economic entomology. It includes the identification, classification, and description of insects in both the adult and immature stages. Accurate and authoritative information on the identity and relationships of insects is required in the daily work concerned with research on insects, with control activities, and with the enforcement of plant and animal quarantines. Without this information it would be impossible to conduct many of these activities in an effective manner. The prompt recognition of the numerous insect pests is essential and can only be done by specialists. The work done under this project plays an important part in the economic work on insect pests carried on by other governmental agencies, State agricultural colleges and experiment stations, universities, etc., in this country and elsewhere. The demand and need for accurate information regarding the identity of insects are increasing. During the past year material submitted for determination more than doubled above the increase of the previous year, which showed an increase of approximately 150 percent. In connection with these activities, investigations are also carried out on anatomy and structure of insects. The proper understanding of the characters by which the hundreds of thousands of kinds may be distinguished is essential.

The generally accepted classifications used for insects group the class insects into 25 orders. The insects belonging to some few of these are not of major economic importance, or the number of species belonging to the group is comparatively few. Specialists employed under this project do not study the species belonging to these groups. There are, however, a number of important orders for which no specialist is employed under this project for special study of these groups. Specimens submitted for identification and belonging to these are handled in the best practical way, either by employed workers or by reference to collaborating specialists. The specialists now available devote their attention to study and identification of specimens belonging to some 14 orders of insects. There are four specialists who study the order which includes beetles, weevils, etc. - an order represented by more than 9,000 species in the District of Columbia. Three specialists study the order which includes flies, containing thousands of species, and including such forms as fruit flies, mosquitoes, horseflies, many parasitic forms, etc. Three workers devote their attention to the order containing butterflies and moths, which embraces such economic forms as the codling moth, the Oriental fruit moth, and hundreds of thousands of other species. Two specialists devote their attention to the order containing true bugs, leafhoppers, etc., of which there are many thousands of kinds, including such important pests as the sugar-beet leafhopper, potato flea hopper, cotton flea hopper, and tarnished plant bug. One specialist devotes his time to the identification of scale insects--a group containing more than 6,000 species, including such well-known forms as the San Jose scale, the red scale of citrus, etc. One specialist studies aphids--a group containing thousands of species, many of which transmit plant diseases. Four specialists are assigned to study the order Hymenoptera, which includes parasites, bees, wasps, and ants, but one of these men is required to devote a large part of his time to general administrative work. One major group of the order Hymenoptera, the Chalcid flies, contains some 70,000 described species, none of which are more than a quarter of an inch long and many--like the beneficial egg parasite, Trichogramma minutum--are less than a sixteenth of an inch long. One specialist devotes his attention to grass-

hoppers and is responsible for the determination of the numerous forms belonging to this and a closely related order containing earwigs. Another specialist studies mites and other ectoparasites, which belong in a number of different closely related orders and attack all kinds of animal and plant life and which include such forms as chicken lice, goat lice, human lice, the orange rust mite, various greenhouse mites, etc.

Insect pest survey.--The activities under this project are concerned with (1) collecting, recording, analyzing, and maintaining permanent records on insect abundance and damage; (2) maintenance of records of the occurrence and distribution of insect pests in foreign countries, information necessary in connection with the enforcement of quarantines regulating the entry of plants and plant products; (3) publication of a monthly bulletin on current insect conditions and an annual summary of the conditions which occur throughout the United States.

Information on insect conditions throughout the country is supplied through cooperative arrangements with entomologists of the Bureau and State entomological agencies. These cooperators furnish notes on the occurrence and relative abundance of insect pests in their respective regions. The assembling and redistribution of current information on insect conditions is of importance to the Bureau but is also useful to State workers in forewarning them of menacing insect conditions occurring in neighboring areas.

The exchange of beneficial insects.--The work under this project is concerned with the general activities incident to exploration for and introduction of natural enemies to aid in the control of injurious insect pests. It also provides for the exchange of these with foreign countries and the coordination of activities incident to the colonization of natural enemies of insect pests established in the United States.

Certain foreign governments cooperate by forwarding to the Bureau natural enemies of insect pests established in the United States. For example, last year the Dominion of Canada provided numbers of a parasite of the black stem sawfly. Arrangements for the entry and receipt of such shipments are handled under this project. Similar cooperation is extended by the Bureau to various foreign governments by sending natural enemies to aid in the control of pests known to occur in their regions. When there is any material expense incident to collection it is paid by the receiving agency. Recent examples of this type are the shipments of parasites of the Oriental fruit moth to Argentina and parasites of the woolly apple aphid to Australia. All of these activities involve a large amount of correspondence, require permits, technical direction, and a knowledge of forms which may be useful.

(v) CONTROL INVESTIGATIONS

Appropriation Act, 1936.....\$62,518
 Budget Estimate, 1937..... 62,518

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Control investigations.....	\$42,855	\$62,518	\$62,518
<u>Unobligated:</u>			
Savings.....	243	- - -	- - -
Total.....	43,098	62,518	62,518

WORK DONE UNDER THIS APPROPRIATION

The work carried on under this appropriation deals with problems having an intimate relation to much of the research, control, and quarantine enforcement work of the Bureau. In the effective solution of these problems it is necessary to cut across crop and divisional lines, but the work in such cases is closely coordinated with that done by other units. Certain activities are concerned with the commercial application of methods developed for the sterilization or disinfection of plants or plant products. It provides for the coordination and standardization of methods of disinfection required by various plant quarantines. It also provides for technical studies to discover or develop insecticides and to obtain new and needed information on the action of insecticides, repellents, and attractants. An important phase of the work is testing new materials that may be developed as the result of chemical studies to determine their toxicity under laboratory conditions on certain standard-test insects and plants. This testing of materials on insects goes hand in hand with investigations on the chemistry of insecticides. These technical studies form the basis for suggestions for new materials or methods that may be useful against particular crop pests. Those which promise to be of value are given further testing at field laboratories concerned with the control of insects for which they may be applicable. The basic information obtained is applicable to many other lines of work on insect control. The following paragraphs briefly refer to special studies now under way.

Studies to determine the application of gaseous insecticides in the destruction of insects of economic importance under varying conditions are in progress, special attention being given to methods of commercially applying fumigants for the treatment of products that move in compliance with quarantine regulations and the treatment of products that are moving interstate and are accompanied by infestations of insects which may not be subject to quarantine. During the past season attention has been given to (1) the completion of work on the fumigation of cotton to eliminate infestations of the pink bollworm. (2) the method of fumigating beans and peas infested with

various seed weevils in railroad cars, and (3) determining the dosage required to effectively fumigate vetch seed infested with Bruchids.

The practicability of sterilizing plants and plant products by the use of heat and cold is being investigated. These activities are likewise concerned principally with the commercial application of methods of treatment by high or low temperatures for products subject to quarantine regulations. Special attention is being given to commercially standardizing the sterilization of grapes admitted from Spain subject to treatment in approved commercial cold storages in New York and Boston. A limited amount of experimental work is done to study the effect of low temperatures on insect enemies of tobacco.

Investigations are under way to determine the practicability of modifying the machinery or nozzles to more effectively apply the sprays used for the control of the gypsy moth. During the past season attention was directed to the development of a centrifugal pump as an aid in overcoming some of the difficulties incident to forcing spray materials through hose lines more than 5,000 feet in length.

Laboratory tests are conducted to determine the effect new insecticidal materials have on insects. These activities include the initial entomological studies on the development of new insecticides and provide for tests of materials developed by the chemists. In these tests standard laboratory insects and plants are used and the initial determination made of the effect new compounds may have on insects and plants. During the past season more than 300 tests were made to determine the toxicity of extracts from various varieties of the native plant Cracca virginiana, which contains small amounts of rotenone. Over 200 organic compounds synthesized in connection with chemical studies were tested to determine their toxicity on mosquito larvae.

Basic studies of insects are conducted to determine facts concerning their relation to their environment and responses to various stimuli. A thorough knowledge of the normal physiology of insects gives a fundamental basis for studies on the toxic substances, such as insecticides, and lethal action of abnormal temperatures. How various poisons affect the digestive system of insects will aid in planning investigations to develop new materials and is one of the problems receiving attention.

Investigations are made to determine the lethal dosage of new and old insecticides under various temperatures and during various seasons. One of the problems on which work is being carried on is concerned with calcium arsenates. It has recently been determined that the anhydrous forms are less toxic than analogous compounds containing water of crystallization. This fact may aid in explaining some of the erratic results obtained from the use of calcium arsenates.

Investigations are being carried out on various tobacco compounds to determine their usefulness as insecticides. The work was expanded with an increase of \$18,000 provided for 1936. Studies are now conducted to determine the possibility of using tobacco insecticides not only as contact and stomach poisons but also as fumigants. These will include the use of tobacco dusts and tobacco extracts mixed with various materials, such as oils and soaps. Preliminary studies have already shown that some fixed nicotine compounds are effective as stomach poisons for certain moths.

(w) INSECTICIDE AND FUNGICIDE INVESTIGATIONS

Appropriation Act, 1936.....\$168,984
 Allotment to "Agricultural Chemical In-
 vestigations," Bureau of Chemistry and
 Soils (for studies of pharmacological
 effects of insecticides)..... -20,000 (a)
 Net available, 1936..... 148,984
 Budget Estimate, 1937..... 148,984

(a) This allotment is carried forward by means of a transfer in the estimates for 1937.

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Chemical investigations on insecticides.....	\$92,607	\$148,984(b)	\$148,984
<u>Unobligated:</u>			
Savings.....	521	- - -	- - -
Total.....	93,128	148,984	148,984

(b) Exclusive of \$20,000 allotted to the item "Agricultural Chemical Investigations," Bureau of Chemistry and Soils, for investigations to determine the toxic effect of insecticides on warm-blooded animals. These studies are directed by the Bureau of Chemistry and Soils, and it is recommended that the funds used for them be transferred to that Bureau.

WORK DONE UNDER THIS APPROPRIATION

General.--The work carried on under this appropriation is designed to develop better and cheaper materials for destroying or repelling injurious insects and fungi. Particular attention is directed to those which are less hazardous to users and less poisonous to anyone eating sprayed or dusted fruits and vegetables. The improvement of existing insecticides and fungicides by detailed study of their physical and chemical properties is also under way. Investigations to originate and improve methods of analyzing them and to devise cheaper methods of manufacture are activities which come under this project. The determination of the most effective chemical means of removing harmful spray residues from fruits and vegetables that have been treated with compounds containing arsenic, lead, copper, fluorine, or other insecticidal and fungicidal materials is also an important phase of the work.

Chemical investigations on insecticides.--Work under this project is concerned with the development of new insecticidal materials for the control of various insect pests and with the development of effective attractants or repellents which may be used to aid in combating insects. Present studies are briefly discussed in the following several paragraphs:

Some of the most useful insecticides--for example, pyrethrum, nicotine, derris, and cube--are natural products of plant life. It is believed that there are many other plants which have insecticidal properties of value. Investigations are being carried on to discover such plants, study the constituents to which the toxicity is due, develop useful insecticidal preparations, and improve insecticides derived from plants containing insecticidal properties of known merit. Special attention is being given to derris, cube, and pyrethrum. An effort is being made to determine ways of preventing the decomposition of effective insecticidal properties of extracts of derris and cube and to study the relationship of the active insecticidal principles of these plants such as rotenone and deguelin. Study is being made of certain native plants to determine those which contain considerable quantities of rotenone and other active ingredients. This study is directed particularly to the so-called devil's shoestring and correlated with biological tests.

Investigations to develop organic insecticides are concerned largely with the synthesizing of various organic compounds which have insecticidal properties and will leave residues relatively non-injurious to warm-blooded animals or man. Hundreds of organic compounds have been obtained or synthesized. One promising material which has recently been developed is now being tested in the field. Special attention is being given to the synthesis of organic compounds containing sulphur and to methods of using phenothiasine or derivatives that may be prepared from it.

Chemical investigations to determine ways of removing spray residues are under way and are closely coordinated with investigations carried on in other units of the Bureau and in the Bureau of Plant Industry. This work involves studies on the chemical phases of the problem and includes an effort to develop chemical methods for removing objectionable residues. Analyses are made to determine the amounts of residues resulting from various spray formulae. The work includes studies not only on apples but also on other fruits such as peaches, grapes, berries, and certain vegetables such as cabbage. In addition to determining the residues which result from the use of insecticides such as the arsenicals, attention is also being given to the determination of methods for determining residues from organic compounds such as derris.

By far the larger part of the insecticides used belong to the inorganic group. Many of these are effective against the insect but are more or less injurious to the foliage. The reaction of these materials is variable, and insecticidal properties may be improved and modifications made in their manufacture. Other materials may be developed by improving their physical properties. Calcium arsenate is being intensively studied to determine basic facts regarding it. Six special forms of calcium arsenate have been prepared for testing to determine the correlation that exists between the chemical constituents and the toxic properties.

Investigations are conducted on the chemistry of fumigants which may aid in the control of insect pests. The aim of these studies is to develop new methods of using well-known chemical compounds for fumigation of growing material or stored products to increase their efficiency and reduce the cost of operations. These activities include chemical investigations to find new compounds which may be used as fumigants to study the correlation between the chemical constituents and insects to determine the toxicity and are

closely correlated with those of other units in the Bureau. Special attention is being given to fumigants for use in mills and milling machinery, the use of fumigants in mushroom houses, and fumigants that may be effectively used for the control of the resistant form of the California red scale of citrus.

Oils and oil emulsions constitute a very important class of insecticides. The activities under this work project have as their object the establishment of the relationship between insecticidal efficiency and the chemical and physical properties of oils or emulsions made from them. Studies are made to determine the relation between the size of the oil droplet and its effectiveness in covering foliage or other materials to which it is applied. Studies are being made on adding other insecticidal compounds to the oils so that they will remain in an oil phase of an emulsion. Interesting information has been secured, and it is believed that this field will develop materials which should have greater insecticidal and ovicidal action.

A large number of materials which in themselves have no insecticidal properties are used in conjunction with insecticides to improve their application. These form an important part of sprays and dusts, and investigations are being made to determine needed information as to their composition, characteristics, and uses. Materials of this class include those added to improve the distribution of insecticidal dust and those used to increase the wetting, spreading, penetrating, and adhesive properties of sprays. This also includes the study of stabilizers to protect various materials from the effect that weather conditions may have on their toxicity. A wide variety of products is studied in connection with these activities.

Goldfish respond to many poisons in a manner similar to many insects. They can be maintained throughout the year in the laboratory and are readily available as test animals. By using them in initial tests studies to develop new plant materials and organic compounds which may be used as insecticides are expedited. Goldfish are now used largely to secure information on the question of the correlation between toxicity and the chemical composition of certain compounds such as phenol and its derivatives, with particular emphasis on the derivatives of thiophenol.

Chemical analyses are made of miscellaneous compounds tested as insecticides. These activities are primarily of a service nature. The work consists of analyzing samples of miscellaneous insecticidal materials to determine whether they meet specifications and the determination of the constituents of materials tested by various laboratories of the Bureau.

Chemical investigations are conducted on tobacco insecticides with the hope of developing new insecticidal uses of nicotine, tobacco, and various tobacco by-products. Previous work has developed a number of nicotine compounds which appear promising, one of which is nicotine combined with an acid-treated peat, forming a compound known as nicotine peat. Work on these compounds and related compounds has been expanded, and special attention is being directed to the concentration and rate of diffusion of nicotine vapor under various practical fumigating conditions and to the physical and chemical properties of dusts containing nicotine to increase their efficiency. The effect of various materials which may be added to

nicotine dust to accelerate the liberation of nicotine is also being studied. These activities were materially expanded with the aid of an increase for this purpose in the appropriation provided for 1936.

EMERGENCY FUNDS

Direct Allotment

Projects	Obligated, 1935
<u>Public Works Allotments (National Industrial Recovery Act):</u>	
Chemical phases of spray-residue investigations.....	\$52,327

(x) TRANSIT INSPECTION

Appropriation Act, 1936.....\$29,059
 Budget Estimate, 1937..... 44,059
 Increase..... 15,000

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Increase
<u>Obligated:</u>				
Transit Inspection.....	\$27,712	\$29,059	\$44,059	+\$15,000 (1)
<u>Unobligated:</u>				
Savings.....	357	- - -	- - -	- - -
Total.....	28,069	29,059	44,059	+ 15,000 (1)

(1) An increase of \$15,000 to strengthen the transit inspection service. Large quantities of articles regulated by Federal quarantines are continuously moving by mail, express, and freight through important transportation centers from those sections of the country where there are infestations of important introduced plant pests. The period of shipping many regulated articles, such as nursery stock, has increased greatly. Without available funds it is impossible to maintain full-time inspectors at such strategic centers of distribution as Pittsburgh, Cincinnati, St. Louis, Kansas City, Memphis, and Washington, D. C. These main channels of rail movement are unguarded during a considerable portion of the year. The importance of having transit inspectors on duty at these points throughout the year is emphasized by the interception at Pittsburgh of 109 lots of materials moving in violation of Federal quarantine, by a temporary inspector during the period of May 3 to June 30, which is considered a dull shipping season. Similar con-

ditions undoubtedly exist at other transportation centers which are unguarded.

The movement of articles through unguarded transportation centers in violation of Federal quarantines, fails to give needed protection to agricultural areas of the Midwest, South and Southwest. It is not unlikely that the important infestation of the Japanese beetle recently discovered at St. Louis may be attributed to the inadequate enforcement of quarantine on commerce lines radiating from the infested quarantine area.

The inspection of regulated articles in transit involves work of a service to all quarantine activities of the Bureau. While inspectors from some units may be, and are, stationed at important centers during temporary busy seasons, it is necessary to have a trained unit to direct the work. The proposed increase provides for stationing trained men at certain important unguarded centers to give protection when it is not practicable to assign temporary help from other projects; also to provide supervisory personnel to direct the seasonal work.

WORK DONE UNDER THIS APPROPRIATION

The only means by which the Department can be assured that safeguards required under quarantine regulations are being followed in the case of mail, express, and freight shipments is to maintain a system of inspecting these products while in transit. This item provides for this work, which consists of checking such shipments at important railway centers and transfer points. The prompt discovery of any weakness in inspection or certification makes it possible to correct faults or add necessary safeguards for the prevention of the establishment of pests at points far removed from the infested area. Experience has shown that when the Department fails to check shipments at railroad centers and transfer points uninspected, untreated, or uncertified products which may be infested are transported by common carriers into uninfested areas and thus threaten the establishment of these pests in such areas. The transit inspection service not only turns back several thousand packages every year but it also serves to keep the employees of common carriers informed of quarantine requirements and thus obtains their active support in cooperating with the Department in its enforcement of Federal quarantines.

(y) FOREIGN PLANT QUARANTINES

Appropriation Act, 1936.....\$625,956
Budget Estimate, 1937..... 625,956

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Import and permit service for issuance of permits for the importation of plants and plant products to comply with plant quarantines.....	\$55,829	\$58,348	\$58,348
Inspection at ports of entry of plants and plant products regulated by plant quarantines.....	548,504	567,608	567,608
Total obligations.....	604,333	625,956	625,956
<u>Unobligated:</u>			
Legislative impoundments.....	480	- - -	- - -
Other amounts unobligated.....	4,765	- - -	- - -
Total.....	609,578	625,956	625,956

WORK DONE UNDER THIS APPROPRIATION

General.--The work done under this appropriation is for the continuance and maintenance of the work to prevent the entry into the United States of injurious insects and plant diseases by controlling and safeguarding the entry of plants and plant products. It involves the enforcement of (1) foreign plant quarantines and regulatory orders issued under the Plant Quarantine Act of 1912, as amended; (2) rules and regulations governing the entry into the United States of railway cars and other vehicles, etc., from Mexico; (3) the Act of 1905 governing the importation of living insects into the United States; and (4) regulations governing the shipment of plants and plant products to the mainland from Hawaii and Puerto Rico.

The activities may be grouped into two main headings. One of these deals with authorizing the importation of plants or plant products which may enter the United States under the quarantines and regulatory orders. The other is concerned with inspections at ports of entry to detect and exclude dangerous plant pests and to see that plant material imported under permit meets the requirements of the authorization.

Import and permit service for issuance of permits for the importation of plants and plant products to comply with plant quarantines.--The activities conducted under this project are concerned with the issuing of permits authorizing the entry of plants and plant products which can be imported without introducing dangerous plant pests. It is necessary to limit the entry of plants

and plant products to those which represent the least pest risk or to those which may be adequately safeguarded. Plants and plant products imported into this country from abroad come under permit, which gives a record of volume, nature of contents, and destination and point of origin. Material accompanied by permits issued in advance is later inspected to determine that the requirements have been fulfilled. These inspections and, if necessary, disinfection or rejection take place usually at the port of entry, except in the case of nursery stock which is inspected at certain designated points where facilities exist for the care of living plants during their inspection. Many hundreds of concerns and individuals are interested in importing these materials and make applications for permits. The routine work requires considerable technical and clerical help, and the special cases involve a large amount of correspondence. These activities also necessitate making and maintaining records. The work is done for the greater part in Washington.

Inspection at ports of entry of plants and plant products regulated by plant quarantines.--The activities conducted under this project are for the purpose of protecting the United States from the entry of injurious insects and plant diseases. This project includes work at the maritime ports of entry and the principal Mexican border ports of entry. It also includes the District of Columbia inspection service, which provides for examination and treatment, if necessary, because of the pest risk involved, in order that domestic plant material entering or leaving the District may be inspected and certified to meet the requirements of States to which it is consigned and to provide inspection and certification for that plant material imported and distributed by the United States Department of Agriculture. This work also includes the inspection and certification for movement to the mainland of plants and plant products permitted from the Territory of Hawaii and also for the protection of Puerto Rico against the entry from foreign countries of injurious insects and plant diseases and to prevent the movement to the mainland of injurious insects and plant diseases known to occur in Puerto Rico. This work includes (1) the inspection of ships, passengers' baggage, ships' stores, and the belongings of travelers entering this country at border ports of entry from Mexico; (2) inspection of materials entered under permits; and (3) inspection of certain classes of plants in the field, following initial inspections at ports, to assure absence of disease or pests which cannot be detected by one inspection. Slightly less than half of the amount allotted to the project is used for inspections at various maritime ports, and a large part of the remainder is used for inspections at ports of entry along the Mexican border.

(z) CERTIFICATION OF EXPORTS

Appropriation Act, 1936.....\$31,862
Budget Estimate, 1937.....31,862

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)
<u>Obligated:</u>			
Certification of exports.....	\$17,160	\$31,862	\$31,862
<u>Unobligated:</u>			
Savings.....	50	- - -	- - -
Total.....	17,210	31,862	31,862

WORK DONE UNDER THIS APPROPRIATION

This item provides for a service to American exporters and consists of inspection and certification of fruit and other plant products to meet the sanitary requirements of the countries to which the products are consigned. A fee is charged for the inspection and the amount collected is returned to the Treasury as miscellaneous receipts. The inspection made is that necessary to issue the certificate required by the country of destination as a condition of entry. The work is carried on at various ports from which the products may be shipped. The nominal fee charged for this work is insufficient to make the project self-supporting. The amount of material offered for inspection and certification for export has materially increased in recent years. During the first quarter of the present fiscal year the number of containers inspected for export was more than 200,000 in excess of the number certified during the same period of the preceding year. Ninety-one foreign countries now require inspection and certification with respect to the presence of insects and plant diseases on fruit and other plant products imported from the United States. The products for which certificates are required include fruits, vegetables, nursery stock, seeds, etc. The American exporter is required to furnish a certificate indicating freedom from dangerous insect pests and plant diseases. It is evident that, if American growers are to maintain their markets in foreign countries having these requirements, all shipments will have to be carefully inspected.

(aa) CHINCH-BUG CONTROL

Appropriation Act, 1936.....	\$2,500,000 (a)
Budget Estimate, 1937.....	- - - -
Decrease.....	<u>2,500,000</u>

(a) Of this amount \$40,000 was obligated under immediately available authority in 1935.

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Decrease
<u>Obligated:</u>				
Chinch bug control.....	\$40,000	\$60,000	- - -	-\$60,000
1936 appropriation obligated in 1935.....	-40,000	+40,000	- - -	- 40,000
Total obligations.....	- - -	100,000	- - -	-100,000
<u>Unobligated:.....</u>	- - -	2,400,000	- - -	-2,400,000
Total.....	- - -	2,500,000	- - -	-2,500,000 (1)

(1) The decrease of \$2,500,000 provides for elimination of the entire item for chinch-bug control included in the appropriations for 1936.

The Agricultural Appropriation Act for 1936 provided \$2,500,000 for a cooperative campaign for the control of chinch bugs, authorizing the purchase and transportation of creosote and other materials to construct barriers to prevent the immature bugs from moving to and destroying young corn. The cost of local handling and utilization of these materials was to be borne by the States, local agencies, and individuals. Of this amount, only \$100,000 was obligated, \$40,000 of which was available for use in 1935 and \$60,000 for use in 1936. The actual expenditures will probably be less than this, as only small amounts of barrier material were used in a few sections of Missouri, Illinois, and Indiana. A small amount (approximately \$200,000) is being used for cooperative surveys to secure information on the numbers of bugs entering hibernation.

Heavy rains at critical periods during last spring and early summer were unfavorable for the chinch bug and favorable for the growth of grasses on which they feed. Consequently, where the bugs survived there was practically no migration by the first generation, and it was unnecessary to construct barriers to protect the young corn. The surviving bugs of the first generation developed practically entirely on grasses, but those of the second generation flew into corn fields and, as usual, developed there. The later part of the season was favorable for chinch bugs in certain areas, and preliminary information indicates that in some sections of Iowa, Illinois, and Indiana as many bugs entered hibernation as in the fall of 1933, preceding the outbreak of 1934 and the first cooperative campaign for chinch bug control. The full results of the survey are not yet available.

(bb) SCREW WORM CONTROL

Appropriation Act, 1936.....	\$480,000 (a)
Budget Estimate, 1937.....	- - -
Decrease.....	<u>480,000</u>

(a) Of this amount, \$60,000 was obligated under immediately available authority in 1935.

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Decrease
Obligated:				
Education and control.....	\$55,589	\$369,411	- - -	-\$369,411
Research on control methods...	4,411	50,589	- - -	- 50,589
Total obligations.....	60,000	420,000	- - -	- 420,000
1936 appropriation obligated in 1935.....	-60,000	+60,000	- - -	- 60,000
Total	- - -	480,000	- - -	- 480,000(1)

(1) The decrease of \$480,000 provides for the elimination of the entire item for screw worm control. The appropriations for the fiscal year 1936 made \$480,000 immediately available for control of this pest. This appropriation provided for:

- (1) A cooperative campaign to educate the stockmen and others in the recently invaded Southeastern States on methods of combating screw worms, the purchase of medicines for treating infested animals, and materials to construct chutes and treating pens; and
- (2) Investigations to determine facts concerning screw worms in the recently infested territory to develop better methods of control under these conditions.

An intensive educational campaign for screw worm control has been carried on in cooperation with the State agencies in Florida, Georgia, Alabama, Mississippi, Louisiana, eastern Texas, and South Carolina. Information on methods for screw-worm control has been made generally available to farmers and others in the recently invaded area through meetings, demonstrations, and personal visits and with the aid of the press. As a result of these activities and the treatments applied by the owners of livestock, the screw worm has been reduced in numbers. Individuals in the area have learned how to cope with the pest. It will therefore be unnecessary to make special provision for the continuation of educational and demonstrational work during the summer of 1936, nor will special provision be required for the construction of chutes, pens, etc., or the distribution of free medicines.

The research work conducted under this item should, however, be continued. To accomplish this the estimates contemplate that \$30,000 be provided for this purpose under the item "Insects Affecting Man and Animals". This is

\$20,589 less than the amount made available during 1936 from the \$55,000 allocated to research from the special appropriation. The \$30,000 will permit continuing important investigations now under way at the laboratory established last spring at Valdosta, Georgia.

(cc) WEST INDIAN FRUIT FLY AND BLACK FLY

Appropriation Act, 1936.....	- - -
Second Deficiency Act, 1935 (for 1936).. <td>\$36,000</td>	\$36,000
Total available, 1936.....	36,000
Budget Estimate, 1937.....	- - -
Decrease.....	<u>36,000</u>

PROJECT STATEMENT

Projects	1935	1936 (Estimated)	1937 (Estimated)	Decrease
West Indian fruit fly and black fly.....	- - -	\$36,000	- - -	-\$36,000 (1)

(1) The decrease of \$36,000 provides the elimination of the special item for eradication of the West Indian fruit fly and citrus black fly from Florida.

The Second Deficiency Appropriation Act, fiscal year 1935, provides an appropriation of \$36,000 for the eradication and control of the West Indian fruit fly and the citrus black fly from Florida. The work on the West Indian fruit fly is a continuation of activities carried on in 1934 and 1935 with an allotment of \$36,000 from Public Works funds. Subsequent to the granting of this allotment the citrus black fly was discovered in Key West, and the appropriation in the Second Deficiency Act authorized work on this pest as well.

The work is carried on in cooperation with the State of Florida and is directed against infestations of these pests found on the Island of Key West. It includes spraying of infested trees for the black fly, application of bait sprays for the fruit fly, removal and destruction of fruits, trapping to determine possible presence of fruit flies, and scouting to determine possible presence of these pests.

The citrus black fly attacks the foliage of many plants, citrus being one of the favorite hosts. It is not known to occur on the mainland of the United States but has been found on the Island of Key West. In other areas where it is established it has caused material damage and increased the cost of insect pest control.

The West Indian fruit fly is native to certain islands of the West Indies and feeds on a number of different kinds of fruits, including mangoes, guavas, hog plums, citrus, etc. No effective method of control is available, and the effort to eradicate it from Key West and the southern part of Florida

is to give protection to the fruit cultures of the southern United States. Recently a single male specimen was trapped on the mainland near Homestead, Florida. The previous work had for the most part been conducted on the Island of Key West.

Some of the citizens of Key West have objected to the work directed against these pests, refusing to permit the State to carry out spray operations and to remove and destroy host fruits. Under these conditions the outcome of these campaigns is uncertain.

EMERGENCY FUNDS

Direct Allotment

Projects	Obligated, 1935
Public Works Allotments (National Industrial Recovery Act): Eradication of West Indian fruit fly from Key West, Florida.....	\$31,314

(dd) GRASSHOPPER CONTROL

In the Agricultural Appropriation Act for the fiscal year 1935, a special appropriation of \$2,354,893 was provided for conducting a grasshopper control campaign in cooperation with affected States, the money being made immediately available. This fund has been used as follows:

Obligated for grasshopper control in 1934.....	\$1,905,677
Obligated for grasshopper control in 1935.....	171,372
Transferred to "Insects Affecting Man and Animals," 1935 (under 10 percent transfer authority).....	5,000
Made available to item "Cereal and Forage Insects" for a grasshopper survey, as authorized by Second Deficiency Act, 1935 (for fiscal year 1936).....	25,000
Unobligated.....	<u>247,844</u>
Total appropriation.....	2,354,893

The work done under this appropriation consisted of an extensive clean-up campaign to control a serious infestation of grasshoppers. The work was completed during the fiscal year 1935.

EMERGENCY FUNDS -- BUREAU TOTAL

Summary

Projects	Obligated, 1935	Estimated obligations, 1936	Estimated obligations, 1937
(1) <u>Direct Allotments:</u>			
<u>Public Works Allotments (National Industrial Recovery Act):</u>			
Spray residue investigations (fruit insects).....	\$64,806	\$1,700	- - -
Chemical phases of investigations on spray residues (insecticide and fungicide investigations).....	52,327	- - -	- - -
Gypsy-moth control.....	448,000	18,682	- - -
White-pine blister rust control.....	1,146,188	19,500	- - -
Dutch elm disease eradication....	569,220	- - -	- - -
Barberry eradication.....	364,527	20,000	- - -
Control of West Indian fruit fly, Key West Fla.	31,314	- - -	- - -
Physical improvements.....	144,733	1,150	- - -
Total, P. W. Allotments (N.I.R.).....	2,821,115	61,032	- - -
<u>Loans and Relief in Stricken Agricultural Areas:</u>			
Japanese beetle control, St. Louis, Mo.	64,000	- - -	- - -
Insect control in shelterbelt area (transferred from Forest Service).....	8,274	- - -	- - -
Total.....	72,274	- - -	- - -
<u>Emergency Relief Appropriation Act of 1935:</u>			
Citrus canker eradication.....	- - -	113,120	\$27,380
Control of phony peach disease	- - -	666,488	165,080
Control and prevention of spread of brown-tail moth.....	- - -	960,000	- - -
Control and prevention of spread of gypsy moth.....	- - -	2,778,000	- - -
White-pine blister rust control.....	- - -	3,164,350	3,164,385
Dutch elm disease eradication..	- - -	2,730,000	- - -
Construction of storage shed at Chadbourn, N.C.	- - -	600	- - -
European corn-borer survey.....	- - -	116,000	- - -
Barberry eradication.....	- - -	1,179,460	1,179,460
Construction of portable insectaries at Tallulah, La. ...	- - -	2,000	- - -
Construction of field insectaries at Presidio, Tex. ..	- - -	4,900	- - -
Construction of field insectaries at College Station, Tex.	- - -	2,000	- - -

Projects	Obligated, 1935	Estimated obligations, 1936	Estimated obligations, 1937
<u>Emergency Relief Appropriation Act of 1935 (Continued)</u>			
Eradication of wild cotton.....	- - -	\$91,200	- - -
Locating and destroying Thurberia plants.....	- - -	167,474	- - -
General administrative expenses.....	- - -	120,000	- - -
Control of peach mosaic.....	- - -	38,680	\$9,240
Total, Emergency Relief.....	- - -	12,134,272	4,545,545
<u>Territory of Hawaii Trust Fund, Processing Taxes, Sugar (authorized by Sec. 15(f), Agricultural Adjustment Act, as amended):</u>			
Developing methods of control of fruit flies in the Territory of Hawaii.....	- - -	64,900	15,100
<u>Puerto Rico Trust Fund, Processing Taxes, Sugar (authorized by Sec. 15(f), Agricultural Adjustment Act, as amended):</u>			
Insect pest survey in Puerto Rico...	- - -	93,000	- - -
Total, Sugar Tax Funds.....	- - -	157,900	15,100
Total, Direct Allotments.....	\$2,893,389	12,353,204	4,560,645
(2) <u>Indirect Allotments:</u>			
<u>Emergency Conservation Work (authorized by Act of March 31, 1933; financed through War Department):</u>			
Control of insect enemies of forests.....	51,166	22,041	- - -
Total, Emergency Funds.....	2,944,555	12,375,245	4,560,645

PASSENGER-CARRYING VEHICLES

A decrease from \$44,375 to \$40,805 is submitted in the passenger-carrying vehicles authorization for 1937. It is estimated that this amount will provide for the purchase of sixty-eight cars, all of which are replacements. These cars are for the use of field employees of the Bureau in various parts of the United States as indicated in the data given in the Budget schedules.

With the exception of a few cars which have been operated over exceedingly rough country or which developed serious mechanical defects after a comparatively short period of use, none of the cars to be replaced are of a model more recent than 1932, and a considerable number of them date back to 1929 and 1930. These machines have been operated under practically all conditions of use, ranging from city streets to extremely rough forest trails. Their average mileage as of September 1, 1935 was approximately 42,000 miles, and considerably more mileage will be added before they are actually turned in. In the experience of the Bureau, cars will not operate efficiently or economically beyond this mileage, and it appears to be distinctly in the best interests of the work to turn them in during the fiscal year 1937, as herein provided.

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